RACTS
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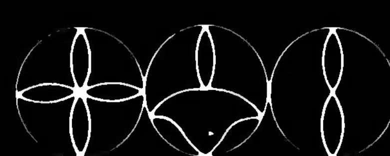
1965

STRACTS

AVAILABLE LITERATURE ON

DIO DIRECTION FINDING

1899 - 1965



SOUTHWEST RESEARCH INSTITUTE   SAN ANTONIO, TEXAS

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ABSTRACTS OF THE AVAILABLE LITERATURE ON RADIO DIRECTION FINDING 1899-1965

Douglas N. Travers
Stuart M. Hixon

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Southwest Research Institute

San Antonio, Texas

SUMMARY

Scope of the Collection

During the 1950's, personnel at the Southwest Research Institute direction finding laboratory were asked to accumulate and organize abstracts in the field of radio direction finding. 'The collecting was started in 1955 and has continued as time permitted to the present. In general, the assignment of personnel to complete the searching, collecting, and abstracting has been on a when-available basis. Much of the work has therefore been accomplished by part-time summer help, student employees, clerical and secretarial assistants, although interpretation, selection, and all indexing has been done by experienced professional direction finding personnel. The collection does not contain patents except in a few cases. Patents prior to 1 June 1948 can be reviewed by reference to Abstract No. 2944; patents after 1948 are beyond the scope of this work.

The collection contains many entries which, when first published, did not appear to apply directly to the subject of radio direction finding. These areas include certain antenna theory and design papers, propagation literature, transmission line papers, and material related to various new applications such as animal tracking. In general, anything related to direction finding antennas and propagation which has been of direct use to the DF staff at Southwest Research Institute has been included. An example of this was the increasing interest in the Beverage wave antenna for wide aperture HF/DF after 1958; thus, antenna papers by Carson, Wise, Wait and many others have been included.

In preparation of the collection, free use has been made of several previously published bibliographies on radio direction finding, particularly those collections prepared by the University of Illinois during the later 1940's. Free use has also been made of abstracts appearing in Wireless World, Science Abstracts, The Engineering Index, Proceedings of the IRE (IEEE), Journal of the Institution of Electrical Engineers (London), and others. The bibliography by Remmler for the 1955-1961 period (Abstract No. 4734) was carefully screened. The bibliography prepared by Keen (Abstract No. 2722) was carefully reviewed, as were the footnotes and bibliographies in many other books including Bond (Abstract No. 1834), Kraus (Abstract No. 3095); Jordan (Abstract No. 3143) and certain other staff-written books. Acknowledgement for the use of the above-mentioned publications is hereby made.

The lack of a single appropriate topic outlet in the domestic formal literature is apparent in the wide range of technical journals used today for publication of DF papers. Papers on DF have appeared occasionally in the Antennas and Propagation Transactions of the IEEE, the Transactions on Military Electronics, the now discontinued Transactions on Aerospace and Navigational Electronics, and the Journal of the National Bureau of Standards. Papers also appear in such places as the Canadian Journal of Physics, the Review of Scientific Instruments, the IEEE Transactions on Electromagnetic Compatibility, the Journal of Wildlife Management, and many others. None of these seems to be a prime source of DF literature, since all are specialized in other areas. Undoubtedly, the most concentrated source of DF literature is in the Journal of the Institution of Electrical Engineers (London). The new Professional Group of the IEEE on Aerospace and Electronic Systems may offer some opportunity for direction finding publications.

Direction finding papers are also often found in conference proceedings; for instance, the National Electronics Conference held annually in Chicago, but it seems that the exchange of DF technical information is primarily accomplished by following certain foreign journals and by circulation of technical reports. For the present collection, therefore, a special effort has been made to obtain or cite as many technical reports as could be located.

When searching the indexes for particular abstracts, it may often be possible to confine searching to a specific period corresponding to a particular interest of the searcher. In this case, the curve of Figure 1 will be of use since it will immediately identify the approximate abstract numbers for any specific period.

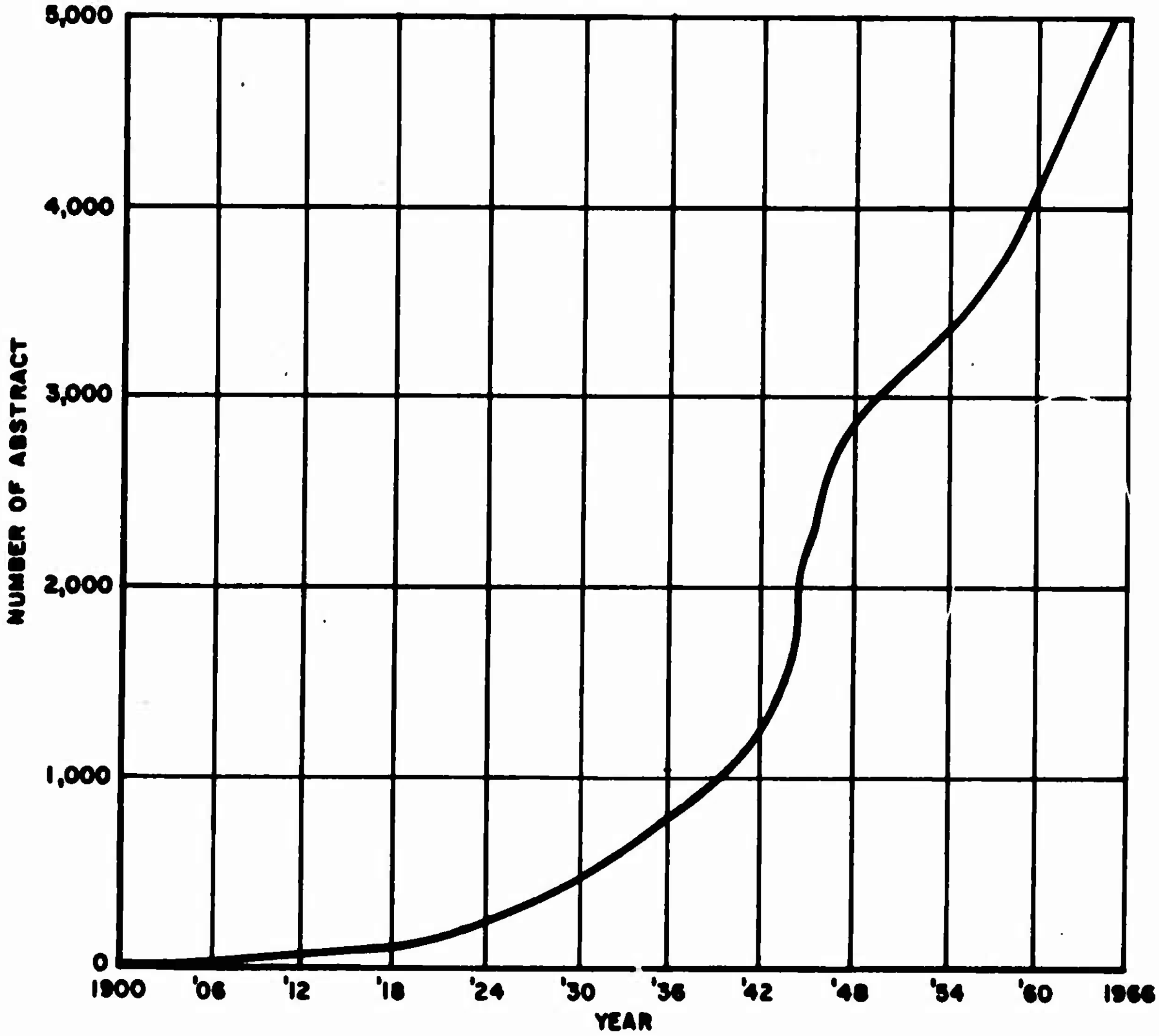

FIGURE 1.
CALENDAR YEAR vs. ABSTRACT NUMBER.

Abstracts' Format

Each abstract has been assigned a number according to its chronological occurrence in the collection. All indexes refer to this number. This is followed by the author, or authors, last name first; the title; and the journal or source, including as complete a citation as was available. In many cases, particularly in the early years, alternate places of publications are listed. In these instances, some effort has been made to list English language publications first, but, in most cases, the earliest publication date was used as the basis for order of journals listed for the same paper. This is followed by the date and the abstract (sometimes more than one) and finally some miscellaneous information at the end of the abstract.

Within each year, the entries for which only the year is known are presented before entries where the month is known. Within each month, entries where the date is unknown appear before entries where the date is known. A few abstracts were inserted at estimated years where no accurate date was verified.

In some cases, two or more abstracts are given. This was judged necessary where previous abstracts were available in different versions and where different information was presented in each. Certain others were required where the original abstract was written before later developments which tended to broaden or change the utilization of the reference with respect to DF research. Still other dual abstracts are presented where one is short and concise and one is long and detailed. In some instances, where copies of the original paper could not be readily obtained, dual abstracts are given for the sake of completeness. In a few cases of short papers, the abstract given is substantially equivalent to the entire paper; these are noted after the abstract in a miscellaneous comment.

In many cases, a comment has been inserted indicating that the abstract is not available. However, the note not available should not be taken to mean that the abstract cannot be obtained. In the majority of these cases, it should be possible to obtain the abstract directly from the source or from the Library of Congress, etc. However, for the purposes of this collection, and, based on the title or the type of document, it was decided not to engage in an extensive effort to obtain the abstracts. All important abstracts were sought, and very few of those sought were actually not available. Finally, a few classified papers have been cited where it is known that the title is unclassified and previous unclassified citations have already appeared. These are also marked "not available."

Following each abstract is a list of parenthetically enclosed symbols which provides certain incidental information. The letters (a) through (f) have been used to provide six categories of such information, as listed below. The first five of these six letters provide information by means of a number.

a - Source of the abstract
b - Type of publication
c - Language
d - Country of origin (usually where published)
e - File number of the paper in the DF reference files at Southwest Research. (Inquiries should be directed to the Director, Applied Electromagnetics.)
f - A self-explanatory comment on the type of material in the paper and in some cases additional miscellaneous information.

The meanings of the numbers in the first five categories are given in the following tables:

Table 1
(a - Source of Abstract)

a-1. Author's Abstract
a-2. IRE (or IEEE) Abstracts
a-3. Science or engineering abstracts
a-4. Written for purposes of this publication by Southwest Research
a-5. Source of abstract unknown
a-6. University of Illinois abstracts

Table 2
(b - Type of Publication)

b-1. Formal literature, technical journals, etc.
b-2. Trade journal or magazine article
b-3. Technical report including miscellaneous government published material
b-4. Private correspondence or unpublished manuscript
b-5. Internal communication within an organization (other than b-4)
b-6. Book
b-7. Advertising material or company published technical notes, including catalog material
b-8. Patent
b-9. Verbally presented paper, otherwise unpublished

Table 3
(c - Language)

c-1.	English	c-14.	Not used
c-2.	Russian	c-15.	French or Flemish
c-3.	French	c-16.	Not used
c-4.	German	c-17.	Swedish
c-5.	Spanish	c-18.	Not used
c-6.	Japanese	c-19.	Czechoslovakian
c-7.	Flemish	c-20.	Danish
c-8.	Unknown	c-21.	Norwegian
c-9.	Italian	c-22.	Polish
c-10.	Not used	c-23.	Hebrew
c-11.	Not used	c-24.	Chinese
c-12.	Not used	c-25.	Thai
c-13.	Not used		

Table 4
(d - Country of origin, usually where published)

d-0.	Unknown	d-13.	Switzerland
d-1.	USA	d-14.	Union of South Africa
d-2.	Russia	d-15.	Belgium
d-3.	France	d-16.	Austria
d-4.	Germany	d-17.	Sweden
d-5.	England	d-18.	Spain
d-6.	Japan	d-19.	Czechoslovakia
d-7.	Canada	d-20.	Denmark
d-8.	India	d-21.	Norway
d-9.	Italy	d-22.	Poland
d-10.	New Zealand	d-23.	Israel
d-11.	Australia	d-24.	People's Republic of China
d-12.	Netherlands	d-25.	Thailand

Table 5
(e - File number in SwRI DF reference file)

A zero indicates that the item is not in the DF reference file. All nonzero numbers refer to the file location in order of accumulation. The number 1000 is a miscellaneous file reference meaning the source was published at Southwest Research. File Number 1000 contains an index of all such reports. It should be noted that this DF file is not located in the Southwest Research Institute main library; inquiries should be addressed to the Director, Applied Electromagnetics, Southwest Research Institute, San Antonio, Texas.

LIST OF JOURNALS AND SOURCES

The following table lists in alphabetical order journals and other sources used to obtain the abstracts. All known titles and abbreviations are listed whether current, obsolete, merged, or otherwise no longer in use. Where known, the sequence of mergers or end of publication is listed. The country of each journal is given when known.

Abbreviation	Complete Title and Address	Abstract Numbers
	A	
	Academic Press, New York, N. Y.	4172
Accad. Lincei Atti	Accademia Nazionale dei Lincei Rendiconti, Rome, Italy	115
	Acustica, S. Hirzel Verlag, Stuttgart, Germany	3814, 4182
ADI	Air Document Index. See: U.S. Government Agencies	
	Adams-Russell Co., Inc., Cambridge, Mass.	4893
	Admiral Corporation, Chicago, Ill.	4025
	Advanced Development Laboratory, Nashua, N. H.	4968
	Aero Digest, Washington, D. C., Ceased with Vol. 73, No. 6, December, 1956	938, 980, 1004, 1034, 1102, 1103, 1104, 1404, 2319, 2378, 2383, 2385, 2474, 2560, 2633, 2861, 2869, 2995, 3038
	Aero Geo. Astro Corporation, Alexandria, Va.	4576
Aeronautical Eng. Rev.	Aeronautical Engineering Review. Changed Title: Aero/Space Engineering with Vol. 17, May, 1958, New York, N. Y.	1409, 2109
	Aeronautique, Paris, France. No longer published.	167
	Aérophile, Paris, France	966
	Aeroplane. Changed title: Aeroplane and Astronautics with Vol. 96, 1959, London, England	838, 2223, 2573, 2805, 3034
	Aerospace Research, Inc., Boston, Mass.	4791
A. I. E. E. AIEE AIEE Trans. Trans. AIEE Trans. Amer. Inst. Elect. Engrs.	American Institute of Electrical Engineers Transactions, New York, N. Y., Merged in 1964 to become Institute of Electrical and Electronics Engineers. See: IEEE	158, 267, 298, 401, 524, 721, 1189, 1195, 4186, 4304, 4540
Air Commerce Bul. - Aeronautics Branch	Air Commerce Bulletin - Aeronautics Branch. See: Civil Aeronautics Journal, Washington, D. C.	741
Air Transport	Air Transport and Civil Aviation, London and New York	2579
	Airborne Instruments Laboratories, Incorporated, Mineola, N. Y.	3344, 3757, 3764, 3787, 3901, 4283, 4404, 4417, 4433, 4444, 4472, 4538, 4817, 4875
Aircraft Eng.	Aircraft Engineering, London, England	593
	Airplane and Marine Direction Finder Corporation, Lindenhurst, N. J.	929
	Airplane and Marine Instruments, Incorporated, Clearfield, Pa.	1412, 1698
	Airtechnology Corporation, Cambridge, Mass.	4849
	Alta Frequenza, Associazione Elettrotecnica Italiana, Via San Paolo 10, Milan, Italy	832, 845, 876, 877, 2410, 2940, 2985, 2999, 4810
Amal. Wireless Aust. Amal. Wireless Aust. Techn. Rev. A.W.A. Tech. Rev. A.W.A. Tech-Review	Amalgamated Wireless Australasia Technical Review, 554 Parramatta Road, Ashfield, New South Wales, Australia	1395, 1399, 1592, 2497, 2663, 2699, 2719, 3817, 4642
	American Aviation, American Aviation Publications, Inc., 1000 Vermont Ave., Washington, D. C.	1038
	American Electronic Labs., Inc., Philadelphia, Pa., Colmar, Pa.*	4129, 4146, 4157, 4598*, 4621*, 4652, 4663, 4664, 4678, 4712, 4830, 4868, 4896, 4931, 5039, 5045, 5135
American Meteorological Society	American Meteorological Society Bulletin, 45 Beacon St., Boston, Mass. 02108	3763
	Andersen Laboratories, Incorporated, West Hartford, Conn.	3351, 3417, 3687

	Andrea Radio Corporation, Long Island City, N. Y.	4421
	Alford, Andrew G., Consulting Engineers Alford, Andrew, Consulting Engineers, Boston, Mass.	3271, 3419, 3509, 4193
Ann. d. Hydrogr.	Annales Hydrographiques, Paris, France	327, 373, 426, 542, 543, 547
Ann. d. Physik Ann. der. Phys.	Annalen der Physik, J. A. Barth, Solomonstrasse, 18B, Leipzig, C l, Germany	20, 50, 65, 102, 162, 424, 617
Ann. Geophys.	Annales de Géophysique, Service des Publications, du. CNRS, 13 Quai Anatole, Paris 7, France	3800
Ann. Radioelect.	Annales de Radioelectricite, Compagnie Generale de TSF, Centre de Documentation de la CSF, 101 Boulevard Murat, Paris 16, France	2521, 3382, 4407, 4740
Annales des Postes Ann. des P. T. T. Annales des PTT	Annales des Postes Télégraphes et Téléphones, Paris, France	254, 347, 399, 570, 784
Annales des Telecommunications Ann. Telecommun.	Annales des Telecommunications, Centre National d'Etudes des Télécommunications. Société de la Revue d'Optique, 3-5 Boulevard Pasteur, Paris 15, France	2998, 3008, 3069, 3114, 3347, 3695, 4126, 4152
Applied Sci. Research	Applied Scientific Research, Section A (Mechanics, Heat, Chemical Engineering, Mathematical Methods), Section B (Electrophysics, Acoustics, Optics, Mathematical Methods), Martinus Nijhoff, Den Haag, Netherlands	3569
Arch. Elec. (Übertragung) Arch. Elekt. Übertragung	Archiv der Elektrischen Übertragung, S. Hirzel Verlag, Stuttgart, Germany	3100, 3195, 3230, 3498, 3511, 3625, 3641, 4223, 5058
Arch. tech. Messen.	Archiv fuer Technisches Messen und Industrielle Messtechnik, R. Oldenbourg, Rosenheimer Str. 145, München 8, Germany	3284
Archiv f. Elektrot. Arch. Elektrotech	Archiv fuer Elektrotechnik, Springer-Verlag, Heidelberger Platz 3, 1 Berlin-Wilmersdorf (West Berlin), Neuenheimer Landstrasse 28-30, 69 Heidelberg, Germany	109, 3334, 4170
	A. R. F. Products, Inc., River Forrest, Ill.	3544, 3554, 3635, 4130, 4158, 4218, 4236, 4267, 4285, 4286, 4306, 4333, 4418
Ark. Mat. Astr. Fys.	Arkiv foer Matematik, Astronomioch Fysik, Uppsala, Sweden (no longer published). Original Publisher: Svenska Vetenskaps Akademien, Stockholm, Sweden	2931
	Armour Research Foundation, Chicago, Ill.	4057
Arts et Métiers	Arts et. Métiers. Revue Technique. Now: Ingenieurs Arts ef Métiers, Paris, France	758
ASRE Technical Note	American Society of Refrigeration Engineers (1922-). Now: Refrigeration Engineering (Ceased in 1959)	3501
ASTIA	Armed Services Technical Information Agency, See: Defense Documentation Center (DDC)	4863, 5114
Atti dell' Assoc. Elettr. Ital.	Atti della Associazione Elettrotecnica Italiana. Now: Elettrotecnica, Milan, Italy	46
Aust. J. Appl. Sci.	Australian Journal of Applied Science, Commonwealth Scientific and Industrial Research Organization, 314 Albert St., East Melbourne, C2, Australia	3647
Austral. J. Phys. Austral. Radio Res. Board Council for Scientific and Industrial Research(Australia) Journal CSIR Australia	Australian Journal of Physics, Commonwealth Scientific and Industrial Research Organization, 314 Albert St., East Melbourne, C. 2, Australia. Now includes several miscellaneous earlier Australian radio research publications.	643, 698, 851, 855, 909, 953, 2350, 3362, 3565, 3623, 3648, 3688, 3798, 4015, 4446, 4447, 4454
Austral. J. Sci. Res.	Australian Journal of Scientific Research. Now: Australian Journal of Physics	3381
	Australia and New Zealand Scientific Research Liaison Office	1552, 1673

Auto. and Telemech. Automation and Remote Control Avtomatika i telemekhanika	Automation and Remote Control, Instrument Society of America, Penn-Sheraton Hotel, 530 William Penn Place, Pittsburgh, Pa., (A translation of Avtomatika i Telemekhanika)	1107, 3858, 3940
	AVCO Manufacturing Corporation, Crosley Division, Cincinnati, Ohio	3700
Aviation	Aviation Week and Space Technology, New York, N.Y., Previously Aviation Week, New York (1947-1956), and Aeronautical Engineering and Aircraft Journal.	382, 481, 498, 512, 1105, 1140, 1304, 1320, 1347, 1354, 1365, 1601, 1703, 2651, 2689

B

Baddow Research Lab. Baddow Research Laboratory	Baddow Research Laboratories, Marconi, Chelmsford, England	1187, 1244, 1580, 1587, 1758, 1791, 2457
	Balco Research Laboratories, Newark, N.J.	3430, 3508
	Batelle Memorial Institute, 505 King Ave., Columbus, Ohio	3492
	Battelle Institut, Frankfurt am main, Germany	4711, 4847, 5098
B.B.C. Engng. Monogr.	BBC Engineering Division Monography, British Broadcasting Corporation Publications, 35 Marylebone High St., London, W1, England	4349
BBC Quart.	BBC Quarterly, London British Broadcasting Corporation Publications, 35 Marylebone High St., London W1, England	2881
	Beama Journal (British Electrical and Allied Manufacturers' Association, London, England, (Formerly: World Power)	332
Beitr. Phys. Atm.	Beitraege zur Physik der freien Atmosphaere, Akademische Verlagsgesellschaft mbh., Cronsteffenstrasse, 6a, Frankfurt am main, Germany	469
Bell Lab. Record Bell Telephone Laboratory, Memo Bell Telephone Laboratories Bell Laboratory Record Communications Bell Telephone Laboratories, Inc.	Bell Laboratories Record, Bell Telephone Laboratories, 463 West St., New York, N.Y. 10014	861, 912, 1009, 1018, 1024, 1070, 1266, 1361, 1362, 1469, 1487, 1619, 1722, 2107, 2112, 2136, 2384, 4794
Bell System Techn. J. Bell System Tech. Jour. Bell System Tech. J. The Bell System Techn. Journ. Bell System Tech. Journal Bell Syst. tech. J.	The Bell System Technical Journal (1922-), American Telephone and Telegraph Co., 195 Broadway, New York 7, N.Y.	316, 343, 391, 415, 458, 550, 560, 584, 681, 882, 970, 1615, 1726, 2930, 3711, 4347, 4348
	Belock Instrument Corporation, College Point, N. Y.	3950, 4002, 4041, 4051, 4098
Bendix Aviation Corporation Bendix Radio Division Bendix Radio	Bendix Corporation, General Offices, Fisher Building, Detroit, Mich.	1094, 1184, 1524, 3322, 3323, 3339, 3412, 3438, 3494, 3495, 3716, 3737, 4574, 4653, 4980, 4996, 5016
	Bendix Radio Engineer, Baltimore, Md.	2189
Ber. Dtsch. Wetterdienstes	Bericht des Deutochen Wetterdienstes in der U.S. Zone, Bad Kissingen, Germany	3576
	Beukers Laboratories, Inc., Stony Brook, N. Y.	5052
Blaupunkt-Werke	Blaupunktwerke, Germany	1249, 1789, 2074, 2180
Boeing Aircraft Company Boeing Airplane Company	Boeing Company, P.O. Box 3707, Seattle, Wash. 98124	1670, 1961, 3346
Boletin de Informaciones Petroleras	Boletin de informaciones petroleras, Buenos Aires, Changed name to: Revista YPF, Buenos Aires, Yacimientos Petroliferos Fiscales Diagonal, R.S. Pena 777, Buenos Aires, Argentina	969
Brit. Commun. and Electronics Brit. Commun. Electronics	British Communications and Electronics, Heywood, Brury House, Russel St., Drury Lane, London WC2, England	3587, 3748, 3923, 4045, 4983

British Standards Institution	British Standards Institution, Reports, London, England	1596
	British Thomson-Houston Co., Ltd., England	2054
	Broadcast Engineer. See: Communications	
Broadcast News	Broadcast News, Published by, RCA, Camden, N.J.	3197
Brown Boveri Rev.	Brown Boveri, Baden Switzerland, 75 Victoria St., London, S.W.1, England	3383
Bul. Technique du Bur. Veritas	Bulletin Technique du Bureau Veritas, Paris, France	165, 404
Bul. Technique de la Sussie Romande	Bulletin Technique de la Sussie Romande, LauSanne, Switzerland	2642
Bull. Acad. Sci. URSS Ser. Phys. Bull. Acad. Sci. (U.R.S.S.)	Bulletin of the Academy of Sciences of the USSR, Physical Series, Columbia Technical Translation, 5 Vermont Ave., White Plains, New York, N.Y., (Translation of: Izvestiya Akademiya Nauk SSSR, Seriya Fisicheskaya.)	1036, 1848, 2501, 2871
Bull. Acad. Sci. USSR, Geophys. Ser.	Bulletin of the Academy of Sciences of the USSR, Geophysics Series, Russian Translation Department, American Geophysical Union, 1515 Massachusetts Ave., Washington 5, D.C., (Translation of: Izvestiya Akademiya Nauk SSSR, Seriya Geofizicheskaya.)	4952
Bull. Amer. Met. Soc.	Bulletin of the American Meteorological Society, 45 Beacon St., Boston 8, Mass.	3283
Bull. Assoc. Suisse Elect. Assoc. Suisse Elect.	Bulletin Association Suisse Des Electriciens, Association Suisse des Electriciens & Union des Centrales Suisses d'Electricite FABAG - Fachschsiften-Verlag & Buchdruckerei AG, Stauffacherquai 36-40, Zurich, Switzerland	1047, 1048, 1560, 1623, 3806
Bull. schweiz electro tech. Ver.	Bulletin, Schweizerischer Elektrotechnischer Verein, Zurich, Switzerland	3205
Bull. Sci. d l'Assn d Eleves	Bulletin Scientifique de L'Association des eleves des ecoles Speciales de 'L'Univ. de Liege, France	64
Bull. Seismol. Soc. Amer.	See: Bulletin of Seismological Society of America	
Bull. S.F.R. Bull. S.F.R. Ser. 5 Bull. Soc. France Elect.	Bulletin de la Societe francaise des Radio electriciens, Paris, France. See also: Soc. Franc. Elect.	654, 696, 907, 961, 2687, 2688

C

CAA CAATD	See: U.S. Government Agencies	
Cables et Transm.	Cables et Transmission-Sotelec, 16 Rue de la Baume, Paris 8, France	2968
	California Institute of Technology, Pasadena, Calif.	1635
Cambridge Phil. Soc. Proc.	Cambridge Philosophical Society, Proceedings, Free School Lane, Cambridge. Publisher: Cambridge University Press, Bentley House, 200 Euston Road, London, NW1; 32 East 57th St., New York 22, N.Y.	526, 765, 864
	Cambridge University Press, Bentley House, 200 Euston Road, London, NW1; 32 East 57th St., New York, N.Y. 10022	1, 2726, 2896
Can. Aviation	Canadian Aviation, MacLean-Hunter Publishing Co., 481 University Ave., Toronto 2, Canada	1037, 1088, 2859
Can. J. Phys.	Canadian Journal of Physics, Division of Administration and Awards, National Research Council of Canada, Ottawa, 2, Canada	3249, 3315, 3605, 3614, 3886, 3903, 4155, 4206, 4263, 4330, 4364, 4489, 4638
Can. Ry. Club-Official Proc.	Canadian Railway Club, Official Proceedings, Montreal, Canada	314

Canad. J. Technol.	Canadian Journal of Technology, National Research Council, Ottawa 2, Canada	3343
Canadian Electrical News	Canadian Electrical News and Steam Engineering Journal. Now: Electrical News (and Engineering), Southam Business Publications, Don Mills, Ontario, Canada	406
	Canadian Journal of Research, National Research Council, Ottawa 2, Canada	2452
	Canoga Electronics Corporation, Fort Walton-Beach, Fla.	4449
	Capehart-Farnsworth Corporation. See: Farnsworth Electronics Company	
Carnegie Institute	Carnegie Institute of Technology, Schenley Park, Pittsburg, Pa. 15213	2056
Cas. Pest. Mat. Fis	Casopis pro pestorania mathematiky a fysiky, Prague, Czechoslovakia	3092
	Centre National D'Etudes Des Telecommunications, Miscellaneous publication of: National Center for Telecommunications Studies, Paris, France	5125
	Centro Radioelettrico Sperimentale "G. Marconi," Rome, Italy	3826
	Ciel et terre, Brussels, Belgium	3783
	Civil Aeronautics Journal, Washington, D.C. See: Air Commerce Bul.	
Colliery Eng.	Colliery Engineer, London, England	418
	Collins Radio Company, Cedar Rapids, Iowa	1096, 1117, 1135, 1158, 1164, 1260, 1290, 1291, 1317, 1388, 1430, 1445, 1473, 1514, 1564, 1624, 1707, 1745, 1885, 1952, 2002, 3547, 4897
	Colorado University, Boulder, Colo.	4773, 5168
	Columbia University, New York, N. Y.	2240, 2411
	Communications. Now: Television Engineering, New York, N.Y.	906, 1016, 1017, 1039, 1100, 1108, 1191, 1613, 1631, 1710, 1811, 2035, 2052, 2451, 2498, 2516, 2561, 2597, 3010
Communication & Broadcast Eng. Broadcast Engineer Communication and Broadcast Eng. Comm. and Broad. Engin.	Communication and Broadcast Engineer. Now: Television Engineering, New York, N. Y. See also Communications.	905, 906, 934, 966
Commun. and Electronics	Communications and Electronics, Part I of: Transactions of the American Institute of Electrical Engineers. See: AIEE	3643
Commun. News	Communications News, Radio Corporation of America, Camden, N.J. Ceased Publication in 1958	3029
	Compagnie Generale de Telegraphie sansfil, Paris, France	4828
Comptes Rendus Comptes Rendus Acad. Sci.	Comptes Rendu hebdomadaire des seances de L'Academie des sciences, Paris, France	80, 204, 217, 226, 270, 300, 340, 417, 419, 439, 443, 445, 448, 488, 489, 582, 583, 637, 648, 724, 736, 743, 756, 764, 811, 2524, 3551, 3732
Comptes Rendus Acad. Sci. URSS Comptes Rendus Acad. Sci. U.R.S.S. C.R. Acad. Sci. U.R.S.S. 20th Aug. 1940 Comp. Rend. Acad. Sci. U.R.S.S.	Comptes Rendu De L'Academie Des Sciences D L'URSS. Now: Doklady Akademii Nauk SSSR, Moscow	1021, 1196, 1233, 2414, 2481, 2749, 2844, 2936, 2937, 2955, 2979, 3120, 3189
	Conductron Corporation, Ann Arbor, Mich.	4923
	Cooley Electronics Laboratories, University of Michigan, Ann Arbor, Mich.	4770
	Cornell Aeronautical Lab., Inc., Buffalo, N. Y.	4410
	Crystal Research Labs., Inc., 29 Allyn St., Hartford, Conn.	3037, 3067, 3122, 3123

	Cubic Corporation, San Diego, Calif.	3512, 3649, 3686, 3742

D

D.A.L., Year book 1940/1941 D.A.L. Yearbook, 1942/1943 (German: D.A.L.)	See: Seutsche Luft. Jahrbuch	1264, 1279, 1393, 1452, 1453, 1456, 1588
DDC	Defense Documentation Center, Cameron Station, Alexandria, Va., (Source for all ASTIA, TIP, and numerous other technical reports.)	
	Defense Research Corporation, Santa Barbara, Calif.	4913
	Denver Research Institute, Denver, Colo.	3918, 4403, 4703, 5212
	Department of Commerce. See: U.S. Governmental Agencies	
	Deutsche Luftwacht. See: Luftwissen	
Deutsche Luft. Jahrbuch	Jahrbuch der deutschen Luftfahrtforschung, Munich, Germany	1022, 1023, 1028
	DECO, Electronics, Inc., Boulder, Colo.	5137, 5223
	Development Engineering Corporation, Leesburg, Va.	3545
D.F.S.	Deutsche Forschungsanstaht fuer Segelflug E.U., Anring. (German Governmental)	1259, 1966
Disc.	Discovery, London, England	533, 689, 1231
	Dissertation Abstracts, University Microfilms, 313 No. First St., Ann Arbor, Mich.	5173
D.L.F.	Deutsche Luftfahrt forschung, Untersuchen und Mitteilungen, Germany	1351
D.L.H.	Deutsche Lufthansa A.G., Staaken	1431, 2077
D.L.V.	Drahtlosetelegraphische und Luftelektrische Versuchsanstalt Grafelfing, Germany	1012, 1106, 1132, 1216, 1220, 1221, 1234, 1287, 1293, 1297, 1334, 1367, 1417, 1499
	Don Lee Broadcasting System, Hollywood, Calif.	2030
Dresden Technische Hochschule-Wissenschaftlich Zeit	Wissenschaftliche Zeitschrift der Dresden technische Hochschule, Dresden, Germany	3462
	Dunlap and Associates, Incorporated, Stanford, Conn.	3448
D.V.L. D.V.L. Berichter D.V.L. Jahrbuch DVL Jahrbuch	Jahrbuch Deutsche Versuchsaustalt fuer Luftfahrt. E.V., Berlin-Adlershof, Germany	455, 595, 640, 775, 817, 841, 842, 844, 874, 885, 895, 932, 1600

E

Ecl. Elect.	Éclaisage électrique. Changed title to: Revue generale de L'électricite, Paris, France	16
	Edo Corporation, College Point, N.Y.	3919
Elec. Engr. & Merchandiser	Electrical Engineer and Merchandises, Melbourne, Australia. Title changed to: Electrical Engineer.	3035
Elec. Rev. Elect. Rev. El. Rev.	The Electrical Review, See: Elect. Review, London, England	37, 55, 81, 86, 181, 200, 309, 453, 483, 568, 657, 760
Elec. Rev. and W. Elect'n	Electrical Review (and Western Electrician - and Industrial Engineer). Chicago, Ill., (1883-1922), Industrial Engineer and Maintenance Engineers (1923-1933). Factory Management and Maintenance. Now: Factory, McGraw-Hill, N.Y.	95

Elec. Wld. Elec. World. El. World	Electrical World, McGraw-Hill Publishing Co., Inc., New York, N.Y.	6, 21, 54, 77, 118, 142
Elecktro tek. Tidskr Elecktrotek. T. Elektrotek Tidsskrift	Elektroteknisk Tidsskrift - Norske Elektroteknisk, Norske Elektrisitetsverkers Forening, Gaustadalleen 39, Blindern, Oslo, Norway	3586, 4219, 4872
Elecn. Electrician	The Electrician, London, England	9, 11, 12, 13, 14, 15, 16, 18, 19, 26, 27, 28, 33, 34, 51, 53, 56, 61, 62, 63, 69, 72, 75, 78, 79, 84, 90, 98, 101, 106, 107, 113, 117, 120, 122, 130, 155, 163, 181, 205, 206, 221, 231, 235, 237, 241, 247, 249, 265, 289, 296, 313, 350, 353, 354, 359, 365, 381, 387, 402, 403, 561, 692, 725, 759, 760, 800, 1218, 2447, 2510, 2685, 2886
Elect. Engineering Elec. Engr. Elect. Engnr. Elect. Engng. Elec. Eng.	Electrical Engineering, Institute of Electrical & Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y. 10021	18, 21, 22, 23, 32, 33, 34, 57, 67, 762, 1256, 2190, 2701
Elect. J.	Electrical Journal, Bouverie House, 154, Fleet St., London, WC4, England	3439
Elect. Rev. of N.Y.	The Electrical Review (New York), No longer published.	18, 31, 36
Elect. Revue, Lond. Elect. Review London Elect. Rev. Lond.	Electrical Review, Iliffe Electrical Publications, Ltd., Dorset House, Stamford St., London, S.E., England	100, 396, 500, 510, 564
Electrical Communications Elect. Communication Elect. Comm. Elect. Commun.	Electrical Communication - International Telephone and Telegraph Corporation, 320 Park Ave., New York 22, N.Y.	746, 913, 940, 950, 1026, 1122, 1195, 1212, 1267, 1842, 1844, 2550, 2615, 2617, 2664, 2769, 2833, 2835, 2836, 2939, 2981, 2982, 3011, 3024, 3300, 3310, 3311, 3431, 3594
	Elektrichestvo (Akademiya Neuk SSSR...) Moscow, USSR	341
	Electromagnetic Research Corporation, College Park, Md.	4384, 4908
	Electronic Communications, Inc., Timonium, Md.	4517
	Electronic Defence Laboratories, Mountain View, Calif.	4926, 4927, 5175
	Electronic Design, Hayden Publishing Co., Inc., New York, N.Y. 10022	3768, 5118
EDN	Electrical Design News, Rogers Publishing Co., Englewood, Colo.	3954
Electronic Engrg. Electronic Engineering Electronic Eng. (London)	Electronic Engineering, Morgan Brothers, Ltd., 28 Essex St., London, WC2, England	1478, 2111, 2430, 2612, 2877, 3159, 4092, 4273, 4523, 5215
Electronic Ind. Electronic Industries Electronic Ind. Tele-Tech. Electronic Industr.	Electronic Industries, Including Industrial Electronics, Chilton Co., Publisher, 56th & Chestnut St., Philadelphia 39, Pa.	2110, 2242, 2475, 2506, 2522, 2543, 2548, 2559, 2596, 3683, 3847, 3942, 4027, 4029, 4141, 4144, 4247, 4297
Electronic Radio Engineer Electronic and Radio Engineer Electronic Technology Electronic Techno.	Now: Industrial Electronics, Iliffe Electrical Publications, Dorset House, Stamford St., London, SE1, England	3730, 3751, 3782, 3941, 4021, 4056, 4071, 4197, 4294, 4339, 4553, 4650
	Electronics, McGraw-Hill, Inc., 330 W. 42nd St., New York, N.Y. 10036	609, 671, 717, 923, 936, 978, 1076, 1126, 1245, 1595, 1757, 1760, 1806, 1808, 1838, 1845, 1855, 1861, 2113, 2282, 2345, 2377, 2446, 2549, 2580, 2599, 2637, 2669, 2858, 2899, 2900, 2926, 2934, 2942, 3001, 3002, 3016, 3047, 3052, 3099, 3146, 3238, 3370, 3477, 3521, 3828, 3870, 3932, 3996, 4038, 4070, 4086, 4099, 4160, 4334, 4393, 4394, 4395, 4511, 4514, 4532, 4572, 4924, 4937, 5106
	Electronics and Power. See: JIEE	
	Electronics Research, Inc. Location Unknown.	3050
	Electronics World. See: Radio Amateur News	

Electronische Rundschau	Elektronische Rundschau. Title changed to: Internationale Elektronische Rundschau-Verlag feur Radio-Foto-Kinotechnik, Eichbornadamm 141-167, Berlin 52, Germany	3506, 3556, 3603
Electrot. Lab. Japan Res. Electrot. Laborat. Japan. Res.	Researches of Electrotechnical Laboratory, Ministry of Communications, Tokyo, Japan	857, 1197
	Electrotechnics, Indian Institute of Science, Bangalore, India	2704
	Electrotechnik (Berlin), Berlin, Germany	2975, 3112, 3135
Electro-Technology	Et Electro-Technology, Canover-mast Publications, New York, N.Y.	5210
Elek. Zeit. Elektrotechn. Zeitschr. Elekt. Zeits. Elektrot Zeits. Electrotechnische Zeit Electrotech. Zeit.	Elektrotechnische Zeitschrift. Ausgabe A-Der Elektrotechniker (Verband Deutscher Elektrotechniker), V.D.E.-Verlag, Bismarckstrasse 33, Berlin-Charlottenburg 2, Germany	69, 92, 101, 116, 135, 446, 1742, 1995
	Elektron Technischer Verlag, Graben 9, Linz-Donau, Austria	3211
	Elektronik, Franzis-Verlag, Karlstrasse 35, München 37, Germany	4191, 4311
	Elektrosvyaz', Ministerstvo svyazi SSR, Moskva. (A translation is published as: Telecommunications and Radio Engineering, Part 1: Telecommunications.)	1313, 4019
Elektrotech. Z. Ed. A Elektrotech. (ETZ)A Elektrotech. Ed. B	See: Elek. Zeit.	3746, 3880, 3894, 4320, 4995
Elektrotechnik u. Maschinenbau Elek. u. Maschinenbau Elek. u. Maschinenbau, Radiotechnik	Elektrotechnik und Maschinenbau, Elektrotechnischer Verein Osterreichs, Eschenbachgasse 9, Wien I. Publisher: Springer-Verlag, Mölkerbasteri 5, Wien I	220, 315, 344, 395, 2542, 2975
	Elettricita. Changed title: Revista Tecnica d'elettricita, No longer published, Milan, Italy	47
	Elettrotecnica, Associazione Elettrotecnica Italiana, Via S. Paolo 10, Milano, Italy	115, 211, 460, 1130
	Elliott Bros., Ltd., London, England	5176
	Emmanuel College, Boston, Mass.	4820, 4991
Eng.	Engineering, London, England	89, 117, 159, 160, 161, 181, 200, 223, 278, 280, 320, 321, 339, 416, 2591, 5198
Engin. Index	Engineering Index, 345 E. 47th St., New York, N.Y. 10017	771, 822, 1028, 1197, 1204, 1884
	Engineer, London, England	124, 309, 353, 356, 389, 742, 1256, 1281, 1468, 2591, 2886, 3007, 3251, 3697, 4309, 4400
	Engineering Research Associates, Inc., Present status and address: Unknown.	3235, 3299
E.N.T. German: E.N.T. ENT Elekt. Nachr.-Tech. (ENT) Elek. Nachrichten	Elektrische Nachrichten technik, Berlin, Germany. Ceased in 1944.	437, 456, 531, 546, 599, 651, 700, 711, 728, 740, 789, 820, 944, 1682
ETZ E.T.Z.	Electrotechnische Zeitschrift, VDE-Verlag Gmbh., Bismarckstrasse 33, Berlin, Germany	38, 171, 518, 555, 639, 748, 998, 1043
Exper. Wireless Expl. Wireless	Experimental Wireless. Now: Industrial Electronics, Iliffe Electrical Publications, London, England	285, 292, 303, 333, 349, 352, 360, 377, 387, 396, 398, 405, 407, 433, 434, 452, 453, 464, 484, 485, 486, 487, 561, 565, 575, 595, 597, 600, 606, 613, 655, 664, 701

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FAA	See: U.S. Governmental Agencies	
	Farnsworth Electronics Company, Fort Wayne, Ind.	3503, 3523, 3561, 3640, 3715, 3734, 3773

FCC	See: U.S. Governmental Agencies	
F.D.R.	Mitteilungen aus des Forschungsanstalt der deutschen Reichespost, Berlin-tempelhof, Germany	1611, 2010
	Federal Telecommunications Laboratories, Nutley, N.J.	893, 1095, 1183, 1294, 1332, 1339, 1359, 1390, 1392, 1428, 1438, 1442, 1443, 1459, 1460, 1470, 1489, 1490, 1494, 1547, 1578, 1622, 1636, 1650, 1655, 1660, 1666, 1667, 1668, 1672, 1686, 1709, 1713, 1729, 1730, 1731, 1738, 1776, 1787, 1824, 1862, 1863, 1899, 1903, 1928, 1933, 1947, 1965, 1967, 1977, 2057, 2071, 2073, 2089, 2094, 2117, 2118, 2151, 2158, 2203, 2210, 2218, 2235, 2249, 2259, 2260, 2262, 2271, 2275, 2298, 2299, 2305, 2327, 2328, 2339, 2342, 2364, 2370, 2423, 2480, 2485, 2621, 2649, 2748, 2752, 2808, 2878, 2908, 2917, 2924, 2951, 2956, 2980, 3009, 3018, 3028, 3030, 3073, 3082, 3084, 3149, 3160, 3178, 3183, 3198, 3220, 3236, 3265, 3616, 3728, 3774, 3829, 3830, 3831, 3873
	Federal Telephone and Radio Corporation, Nutley, N.J. Same as Federal Telecommunications Laboratories.	1186, 1386, 1387, 1475, 1693, 1697, 1746, 1765, 1826, 1827, 1829, 1830, 1831, 1832, 1856, 1866, 1869, 1877, 1883, 1894, 1914, 1926, 1945, 1992, 2007, 2013, 2020, 2021, 2031, 2058, 2153, 2172, 2264, 2296, 2310, 2335, 2398, 2424, 2425, 2536, 2539, 2540, 2541, 2551, 2591, 2627, 2691, 2742, 2840
Fermeldetech. Z. FTZ	Zeitschrift fuer Fernmeldetechnik, Muenchen, Germany	3167, 3173, 3287, 3352, 3366, 3402, 3531, 3532, 3533
F.F.I.	Flugfunk-Forschungsinstitut, Oberpfaffenhofen, Germany	1166, 1175, 1432, 1661
F.F.O.	Unknown	1116
	Fisher Research Laboratory, Palo Alto, Calif.	1463
	Flight. Changed to: Flight International, Iliffe Transport Publications, Ltd., Dorset House, Stamford St., London S.E. 1, England	2406
	Florence University, Florence, Italy	4445
	Frequenz, Fachverlag Schiele und Schon, Markgrafenstrasse 11, Berlin, SW61, Germany	3150, 3534, 3741, 3756, 3609, 3912, 3929, 4224, 4380, 4718, 4747, 4758
F.T.M.	Flugtechnische Mitteilungen. Address: Unknown. Germany	1141
Funk. Tech. Monatshefte Funktech. Monatshefte	Funktechnische Monatshefte, Berlin, Germany	798, 843, 968, 993, 1133
Funk U. Ton. Funk und Ton	See: Electronische Rundschau	691, 725, 3026, 3239, 3415

G

	Gabriel Labs, Needham Heights, Mass.	3504, 3595
	General Atronics Corp., Bala-Cynwyd, Pa.	4053, 4682, 5200
	General Dynamics Corporation, Fort Worth, Texas	4887
	General Dynamics Corporation, Electric Boat Division, Groton, Conn.	4759
Gen. Elect. Rev.	General Electric Review, Schnectady, N.Y. Ceased publication in November 1958.	752, 753, 1702, 3407
	General Electric Company, Syracuse, N.Y.	4776
General Electronic Laboratories General Electronic Laboratories, Inc.	General Electronic Industries, Division of Maguire Industries, Cambridge, Mass.	1769, 3541, 3872, 3949, 4001, 4221, 4305, 4353, 4500
Genie Civil	Genie Civil; révue generale des techniques (1880-5 rue Jules Lefebvre, Paris (9e), France	412, 647, 666, 1051
	Genoa University, Genoa, Italy	4486

Geofys. Publ.	Geofysiske Publikasjoner, Geophysica Norvegica - Norske Videnskaps-Akademi i Oslo. Publication address: H. Aschehoug (W. Nygaard), Oslo, Norway	3564
	Geophysics, Society of Exploration Geophysists Shell Bldg., Tulsa 19, Okla., (formerly: Houston, Texas).	1410, 3289, 3410
	Georgia Institute of Technology, Atlanta, Ga.	5144, 5186
Ges. Vor. Lilienthal-Gesellschaft Lilienthal-Gesellschaft Lilienthal-Gesellschaft fuer Luftfahrtforschung	Gesammelte Vortrage der Hauptversammlung der Lilienthall Gesellshaft fuer Luftfahrtforschung, Germany	951, 974, 1084
G. L. Z.	Generalluftzeugmeister, Germany. Governmental report	1120, 1168, 2199
	Goodyear Aerospace Corp., Litchfield Park, Ariz.	5095, 5130, 5187
	Granger Associates, Palo Alto, Calif.	4217, 4228, 4296, 4459, 4545
Great Britian; Governmental Agencies	Great Britian; Governmental Agencies	
	Admirality	2039, 2131, 4456
	Admirality Department of Scientific Research and Development	1913, 1916, 1919, 1920, 1921, 1922, 1934
	Admirality Fleet Order	2525
	Admirality Naval Intelligency Division	2390
ASE	Admirality Signal Establishment	132, 633, 694, 1086, 1087, 1089, 1090, 1118, 1202, 1211, 1251, 1336, 1337, 1355, 1356, 1357, 1366, 1374, 1414, 1457, 1467, 1498, 1505, 1511, 1513, 1515, 1526, 1529, 1546, 1548, 1562, 1609, 1627, 1643, 1680, 1687, 1718, 1720, 1732, 1748, 1770, 1790, 1794, 1812, 1889, 1913, 1917, 1956, 1957, 1974, 1981, 1989, 2049, 2051, 2119, 2133, 2243, 2247, 2286, 2343, 2386, 2432, 2445, 2448, 2453, 2468, 2552, 2585, 2594, 2613, 2619, 2636, 2670, 2674, 2676, 2729, 2831, 3061, 3672
	Admirality Weapons Department	5026
	Air Council of the United Kingdom	2379
	Air Defense Research and Development Establishment Ministry of Supply, Great Britian	1577
	Army Operational Research Group	2293, 2387
	British Intelligence Objectives Subcommittee	2610, 2614, 2667, 2671
CEPE	Central Experimental and Proving Establishment	4145, 4359, 4379, 4428, 4603, 4690, 4779
	Central Radio Bureau	1358, 2569
	Central Signals Establishment	4465
	Coastal Command Development Unit	2454
	Commonwealth Scientific and Industrial Research Organization	3078
	Commonwealth Scienfitic Office, Washington, D. C.	2337, 2417, 2666, 2807
	Defense Research Telecommunications Establishment, Ottawa, Ontario, Canada	4505, 4963
	Ministry of Aviation	1350, 1472, 1572, 1659, 1736, 1980, 1982, 1994, 2027, 2120, 2188, 2270, 2807, 3148, 4235, 4705
	National Physics Laboratory; Radio Research Board	1136, 1165, 1193, 1208, 1253, 1254, 1308, 1314, 1329, 1330, 1343, 1368, 1370, 1376, 1377, 1378, 1381, 1422, 1424, 1426, 1435, 1437, 1488, 1517, 1576, 1618, 1633, 1639, 1646, 1648, 1653, 1665, 1689, 1765, 1711, 1728, 1733, 1734, 1775, 1816, 1820, 1907, 1925, 1929, 1958, 2047, 2088, 2176, 2191, 2208, 2209, 2239, 2263, 2331, 2362, 2366 2628

Great Britian: Governmental Agencies (Cont'd)

	Radio Countermeasures Board	2220
	Royal Aircraft Establishment	1565, 1867, 1988, 2012, 2044, 2188, 2270, 2511, 2556, 2589, 2660, 3191, 3241, 3348, 3397, 3408, 3702, 3841, 4851, 5003
RAF	Royal Air Force	718, 1610, 1890
	Royal Australian Air Force	1545, 1640
	Royal Radar Establishment	3672
	Scientific Advisory Council, Ministry of Supply	2125, 2545
	Department of Scientific and Industrial Research, Dorland House, 14-16 Regent St., London, SW1, England	320, 329, 371, 436, 474, 646, 860, 1373, 2163, 2969, 3088
	Signals Research and Development Establishment, Ministry of Supply	1739, 1740, 1857, 2338, 2371, 2405, 2626, 2639
	Telecommunications Research Establishment, Ministry of Supply	1322, 1338, 1340, 1652, 1685, 2422, 2486
	War Office	2028

H

	Halle A. D. Saale Luftnachrichtenschule. See: L. H. S.	
	Hallicrafters Company, Chicago, Ill.	4282
Hansa Deutsche Schiff. Hansa Deutsche Schiffahrtszeitschrift	Hansa Zeitschrift fuer Schiffahrt, Schiffbau, Hafen, C. Schroedter & Co., Stubbenhuk 10, Hamburg, Germany	541, 705
	Harvard University, Cruft Laboratory, Cambridge, Mass.	2018, 2477, 2852, 2885, 2933, 3207, 3282, 3379, 3507, 3568, 3866, 5013
Hazeltine Hazeltine Corporation	Hazeltine Technical Development Center, Inc., General Offices, Indianapolis, Ind.	1315, 1316, 1321, 1341, 1342, 1455, 1563, 1574, 4579
Helv. Phys. Acta.	Helvetica Physica Acta, Birkhauser Verlag, Basel 10, Switzerland	1887
	Herbach & Rademan, Incorporated, Philadelphia, Pa.	2964
	Hewlett-Packard Journal, Hewlett-Packard, Palo Alto, Calif.	4796
	Heywood and Company, Ltd., London, England	4175
	Hickok Electrical Instrument Company, Cleveland, Ohio	4147, 4237
Hocht. tech. u. Elek. akus. Hochf: tech. u. Elek: akus Hochfreq. u. Elektro. Hoch: Tech. u. Elek: akus	Hochfrequenztechnik und Elektroakustik, Akademische Verlagsgesellschaft Geest und Portig K-G, Sternwartenstrasse 8, Leipzig, C1, Germany. See: Jahrb. d. Drahtl. See also Zeits f. Hochfrequenztechnik	712, 734, 744, 745, 749, 750, 781, 799, 802, 803, 840, 858, 894, 904, 917, 921, 924, 945, 962, 979, 1061, 1173, 1190, 1274, 1276, 1280, 1285, 1288, 1300, 1301, 1302, 1303, 1311, 1319, 1335, 1346, 1352, 1363, 1397, 1402, 1403, 1406, 1433, 1383, 1500, 1520, 1532, 1544, 1558, 1561, 1569, 1570, 1571, 1572, 1573, 1589, 1590, 1593, 1594, 1604, 1606, 1628, 1645, 1662, 1664, 1741, 1759, 1771, 1772
	Honeywell, Inc., 2701 4th Ave., S., Minneapolis, Minn.	5089
HRB-Singer, Incorporated	Haller, Raymond and Brown, Inc., State College, Pennsylvania, Pa.	3720, 3840, 3884, 3944, 3997, 4026, 4072, 4288, 5002
Hughes Aircraft Corporation	Hughes Aircraft Company, Main Offices: Centinela & Teale, Culver City, Calif. 90230	3491, 3769, 4032, 4981, 5131
Hydrographic Rev.	Hydrographic Review. Now: International Hydrographic Review, Bureau Hydrographique International, Monte-Carlo, Monaco	788, 1020

I

IEE Proc.	Institution of Electrical Engineers Proceedings. See: Proc. IEE	
IEEE Int. Convention Rec.	IEEE International Convention Record.	4765, 4916
IEEE Proc.	IEEE Proceedings. See: Proc. Inst. Radio Engrs.	
IEEE Trans. Trans. IEEE	IEEE Transactions. Formerly: Transactions of the Institute of Radio Engineers (IRE). Institute of Electrical and Electronics Engineers, Inc., Box A, Lenox Hill Station, New York, N.Y. 10021. See: IRE Transactions	4785, 4786, 4808, 4812, 4818, 4823, 4836, 4838, 4843, 4866, 4944, 4945, 4946, 4947, 4948, 4949, 4950, 4954, 4955, 4956, 4957, 4958, 4959, 4971, 4975, 4986, 4988, 4989, 4990, 4992, 5000, 5009, 5011, 5019, 5030, 5033, 5036, 5037, 3046, 5062, 5086, 5087, 5090, 5093, 5101, 5110, 5111, 5112, 5133, 5137, 5138, 5147, 5148, 5152, 5153, 5157, 5158, 5160, 5162, 5167, 5171, 5182, 5183, 5220
	Illinois Wildlife, Illinois Federation of Sportsman's Clubs, 508 West Charles St., Champaign, Ill.	4518
Indian Jour. Phys. (India) Indian J. Phys.	Indian Journal of Physics and Proceedings of the Indian Association for the Cultivation of Science, 2 and 3 Lady Willingdon Road, Calcutta 32, India	2862, 2990, 3054, 3723, 3725
	Industrial Electronics, Iliffe Electrical Publications, London, England. See: Exper. Wireless	
	Industrial Electronics Research, Incorporated, Detroit, Mich.	2695, 2829
	Industrie Electrique, Paris, France. Discontinued in 1936.	513, 521, 528
	Innsbruck University, Innsbruck, Austria	4856, 4902, 4977, 5067
Inst. El. Eng. Inst. El. Eng., J.	See: Proceedings IEE and JIEE, London, England	359, 387
Inst. Eng. Australia J.	Journal of the Institution of Engineers of Australia, Sidney, Australia	1006
	Institut de Geophysique et Sciences Diverses, French	1839
	Institution of Electrical Engineers Monogram, Savoy Place, London, WC2, England. See also Proc. IEE, Part IV and Part C	3583, 4227, 4278, 4340, 4434, 4501, 4580
International Sci. Radio Union Proceedings	International Scientific Radio Union (URSI), 7 Place Emile Danco, Uccle, Brussels 18, Belgium. See also URSI	1027
	International Telecommunications Laboratory, England	2604
	International Telephone and Radio Laboratory	1382
	Ionosphere Conference, London, England	4641
IRE Proc. Inst. Radio Eng., Proc.	See: Proc. IRE	
IRE (miscellaneous) IRE, Annual Convention Paper I.R.E. Convention Record Convention Record of the Inst. Radio Engrs. Convention Record I.R.E. IRE-URSI Symposium IRE Nat. Conv. Record 1958 Southwestern IRE Conference Proceedings IRE Int. Conv. Record IRE Wescon Conv. Rec. Western Electronics Show & Convention Wescon Tech. Papers	Institute of Radio Engineers. Now: Institute of Electrical and Electronics Engineers. See: Trans. IEEE	1098, 3191, 3336, 3338, 3431, 3574, 3588, 3591, 3668, 3718, 3794, 3799, 3867, 3966, 3969, 3973, 3975, 3976, 3979, 3982, 4017, 4169, 4177, 4178, 4179, 4184, 4187, 4188, 4196, 4463, 4479, 4741, 4742, 4767
IRE Proc.	See: Proc. IRE	

IRE Transactions Trans. IRE IRE Trans.	Institute of Radio Engineers Transactions. Changed to: IEEE Transactions, Institute of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N. Y. 10021	3450, 3459, 3470, 3485, 3487, 3499, 3510, 3529, 3537, 3538, 3539, 3540, 3546, 3548, 3549, 3550, 3552, 3553, 3555, 3589, 3590, 3613, 3619, 3626, 3631, 3632, 3633, 3670, 3673, 3675, 3677, 3678, 3679, 3692, 3761, 3775, 3781, 3784, 3820, 3821, 3855, 3890, 3902, 3910, 3913, 3934, 3959, 3963, 3964, 3991, 3992, 3993, 3995, 4003, 4004, 4005, 4006, 4007, 4018, 4031, 4043, 4058, 4059, 4060, 4062, 4063, 4067, 4082, 4085, 4087, 4090, 4091, 4093, 4094, 4107, 4108, 4110, 4111, 4113, 4115, 4118, 4119, 4153, 4192, 4199, 4202, 4204, 4205, 4207, 4209, 4212, 4213, 4225, 4241, 4243, 4246, 4256, 4260, 4262, 4266, 4271, 4272, 4280, 4291, 4292, 4293, 4295, 4298, 4299, 4300, 4301, 4302, 4312, 4319, 4327, 4329, 4331, 4345, 4346, 4352, 4365, 4372, 4374, 4376, 4378, 4381, 4387, 4388, 4389, 4390, 4442, 4448, 4466, 4467, 4468, 4469, 4474, 4476, 4502, 4503, 4506, 4508, 4539, 4541, 4578, 4615, 4622, 4628, 4681, 4683, 4685, 4686, 4687, 4688, 4706, 4708, 4723, 4737, 4744, 4752, 5084,
	Israel Institute of Technology, Israel	4814
	I. T. E. Circuit Breaker Company, General Offices: 1900 Hamilton St., Philadelphia, Pa. 19130	3906
ITT Laboratories	ITT Federal Laboratories. See also Fed. Telec. Laboratorys, Nutley, N. J.	3860, 3900, 3933, 3952, 4013, 4270, 4356, 4405, 4553, 4724, 4725, 4809, 4895, 4998
Izv. Acad. Sci. USSR, Phys. Solid Earth	Izvestiya Akademii Nauk, SSSR Seriya Fizicheskaya. Bulletin of the Academy of Sciences of the USSR, Physical Series, Moscow	5075
Izv. Elektroprom. Slab. Toka. Izvestiya Elektroprom. Slab. Toka	Izvestiya Elektropromnishlennosti Slaboyho, Toka, Moscow	859, 903, 908, 956, 1030, 1176, 1192, 1198
Izvestiya VUZ, Radiofizika	Bulletin of the Academy of Sciences, USSR. Radiophysics Section	4362

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J. Atmos. Terrest. Phys. J. Atmospheric and Terrestial Physics	Journal of Atmospheric and Terrestrial Physics, Pergamon Press, Headington Hill Hall, Oxford; 122 East 55th St., New York, 22, N. Y.	3458, 3461, 3464, 3559, 3560, 3563, 3566, 3578, 3653, 3654, 3655, 3656, 3657, 3658, 3659, 3660, 3664, 3793, 3795, 3796, 3802, 3807, 3808, 3812, 3815, 3967, 3977, 4009, 4189, 4234, 4324, 4521, 4554, 4766, 4780, 4883, 5057, 5060, 5069, 5076, 5082, 5190, 5191
J. Geom-Geoel. J. Geomagn-Geoelect.	Journal of Geomagnetism and Geoelectricity, Society of Terrestrial Magnetism and Electricity of Japan. Geophysical Institute, Kyoto University, Kyoto, Japan	3981, 3662
J. Geophys. Res. J. Geophys. Research	Journal of Geophysical Research, American Geophysical Union, 1145 Nineteenth St., NW, Washington, D. C. 20036. Formerly: Terrestrial Magnetism and Atmospheric Electricity.	3326, 3349, 3369, 3488, 3555, 3753, 3844, 3889, 4028, 4203, 4248, 4255, 4258, 4269, 4277, 4303, 4341, 4351, 4368, 4382, 4826, 4829, 4886
J. I. E. E. Inst. El. Eng., J. JIEE Journ. I. E. E. Jour. I. E. E.	Journal of the Institution of Electrical Engineers, Institution of Electrical Engineers, Savoy Place, London, WC2, England. Title changed to: Electronics & Power.	5, 117, 172, 181, 200, 212, 241, 247, 263, 272, 277, 286, 302, 305, 307, 312, 317, 355, 367, 386, 396, 398, 407, 453, 480, 485, 486, 487, 551, 613, 664, 668, 732, 735, 757, 779, 780, 808, 824, 852, 871, 886, 910, 975, 982, 1010, 1011, 1033, 1067, 1068, 1072, 1115, 1125, 1161, 1163, 1213, 1218, 1225, 1231, 1239, 1562, 1836, 2142, 2410, 2499, 2500, 2504, 2505, 2508, 2509, 2638, 2665, 2668, 2698, 2703, 2728, 2731, 2750, 2751, 2753, 2754, 2755, 2756, 2757, 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2767, 2768, 2769, 2770, 2771, 2772, 2773, 2774, 2775, 2776, 2777, 2778, 2779, 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, 2789, 2790, 2791, 2792, 2793, 2794, 2795, 2796, 2798, 2799, 2800, 2801, 2802, 2902, 2949, 2950, 2972, 2984, 2988, 3045, 3221, 3377, 3854, 5123
J. Inst. Elect. Commun. Engrs. Japan J. Inst. Elec. Commun. Japan	Journal of the Institute of Electrical Communication Engineers of Japan, 2-8 Fujimicho, Chiyodaku, Tokyo, Japan	3285, 3704, 3791, 3962, 4156, 4753

J. Inst. Tellcomm. Engrs.	Journal of the Institution of Telecommunication Engineers, Post Box 481, F12 South Extension, Part II, Ring Road, New Delhi 16, India	4042, 4281
J. de la Marine Marchande et de la Navigation Aerienne	Journal de la Marine Marchande, Paris, France	2586
J. math. Phys.	Journal of Mathematical Physics, American Institute of Physics, 335 East 45th St., New York 17, N.Y.	4633, 4757
J. Meteor.	Journal of Meteorology, Lancaster, Pa.	2913
J. P.O. Eng. J. P.O. Elect. Eng.	See: Post Office Electrical Engineers' Journal	
J. Phys. Radium (French)	Journal de Physique et le Radium. Now: Journal de Physique, 12 Place Henré-Bergson, Paris (8E), France	3465
J. Phys. U.S.S.R.	Journal of Physics, Moscow. Discontinued in 1947.	1265, 1400, 2166
J. Radio Res. Lab. (Japan)	Journal of the Radio Research Laboratories, Ministry of Posts and Telecommunications, Kokubunji PO, Tokyo, Japan	4430
J. Roy. Aero. Soc.	Journal of the Royal Aeronautical Society, 4 Hamiltonon Place, London, W1, England	1062, 2823
J. Telecommun.	Journal des télécommunications, Union International des Telecommunications, UIT, Place de Nations, Geneva, Switzerland	722, 2659, 4450
J. Wildlife Mgmt.	Journal of Wildlife Management, Wildlife Society, Purdue University, Lafatte, Ind.	3980, 4646, 4771, 4844, 4922, 5049, 5092
Jahrb. d. Drahtl, Jahrb. d. Draht. Jahrbuch d. Drahtlosen Telegraphie Jahrb. d. Drahtl. Tele. Jahrb. d. Drahtl. Telegraphie Jahrbuch Zeit. für drantlose Telegraphic u. Telephonic Jahrbuch u Teleph.	Jahrbuch der drahtlosen Telegraphie u. Telephonic. Now: Hochfrequenstechnik und Electroakustik akademische Verlagsgesellschaft, Leipzig, Germany	16, 24, 25, 29, 35, 39. 40, 41, 42, 43, 44, 45, 60, 70, 71, 88, 91, 92, 93, 94, 97, 104, 106, 110, 119, 123, 140, 141, 145, 146, 148, 176, 178, 179, 185, 186, 188, 199, 213, 216, 234, 239, 251, 255, 259, 264, 268, 271, 2261
	Jefferson-Travis, Incorporated, New York, N.Y.	1440
JNL of the Institue of Navigation (London) J. Inst. Nav.	Journal of the Institute of Navigation, 1 Kensington Gore, London, SW7. Publication address: John Murray, 50 Albemarle St., London, W1, England	3078, 3862, 3938, 3939
	Johns Hopkins University, Applied Physics Laboratory, Silver Spring, Md.	5083, 5224
Jour. Acous. Soc. Amer. J. Acoust. Soc. Am.	Acoustical Society of America, Journal, American Institute of Physics, Inc., 335 E. 45th St., New York, N.Y. 10017	2849, 3729
Jour. Am. Soc. of Nav. Engrs. Jl. Am. Soc. Naval Engrs. Journal Amer. Soc. Naval Engineers	Journal of the American Society of Naval Engineers. Now: Naval Engineers Journal, American Society of Naval Engineers, Inc., 1012 Fourteenth St., NW, Washington, D.C. 20005	82, 103, 180, 3713, 4587
Jour. Brit. I.R.E. J. Brit. IRE J. Brit. Instn. Radio Engrs.	Journal of the British Institution of Radio Engineers, 9 Bedford Square, London, WC1, England	3059, 3080, 3876, 4010, 4321, 4519, 4563, 4854
Jour. Inst. Nav.	Journal of the Institute of Navigation, Royal Geographic Society, 1 Kensington Gore, London, SW7, England	3133, 3154
Jour. Maryland Acad. Sc.	Journal of the Maryland Academy of Sciences, Baltimore, Md. Ceased publication in 1932.	601
Jour. Opt. Soc. Amer.	Optical Society of America, Journal, American Institute of Physics, 335 E. 45th St., New York, N.Y. 10017	3101
Jour. of Technical Physics	Journal of Technical Physics, U.S. Department of Commerce, Office of Technical Services. Translation of: Zhurnal Tekhnicheskoi Fiziki, (Russian).	3394
Journ. Aero Sci.	Journal of the Aeronautical Sciences. Now: Journal of the Aerospace Sciences	1058

Journ. Roy. Soc. Arts. Roy. Soc. Arts., J. Roy. Soc. Arts Jour. Soc of Arts	Journal of the Royal Society of Arts, 6-18 John Adam St., London, WC2, England	83, 306, 309, 389
Journ. Sci. Instruments J. Sci. Instrum. J. Sci. Instruments Journ. Sci. Inst. London	Journal of Scientific Instruments, Institute of Physics and the Physical Society, 47 Belgrave Square, London, SW1, England	449, 495, 571, 644, 660
Journ. Tech. Physics U.S.S.R.	Journal of Technical Physics, USSR. Now: Journal of Technical Physics, Moscow	1111, 1394
Journ. Wash. Acad. Sc. J. Washington Acad. Sci.	Journal of the Washington Academy of Sciences. Now: Washington Academy of Sciences, Journal, Washington Academy of Sciences, 1530 P. St., Washington, D.C. 20005	144, 207, 451
Journal of Applied Physics J. appl. Phys.	Journal of Applied Physics, American Institute of Physics, 335 E. 45th St., New York, N.Y. 10017	1466, 1858, 1860, 1985, 1987, 2848, 2905, [illegible]83, 3102, 3153, 3158, 3164, 3202, 3210, 3244, 3288, 3340, 3350, 3354, 3356, 3359, 3361, 3369, 3671, 3845, 4323, 4385
Journal Frank. Institute Franklin Inst. -Jl. Journ. Franklin Inst. Frank. Inst. J. Frank. Inst. Journ. J. Franklin Inst.	Franklin Institute, Journal, Franklin Institute of the State of Pennsylvania, Philadelphia 3, Pa.	152, 342, 379, 394, 397, 509, 594, 1179, 1271, 4473
Journal IEE, Japan	Journal of the Institute of Electrical Engineers of Japan, Tokyo, Japan	606
	Journal of Research, National Bureau of Standards. See: U.S. Governmental Agencies	

K

K. Tekn. Hoegs k. Handl.	Kungliga Tekniska Hoegskolans Handlingar, Transactions of the Royal Institute of Technology, Stockholm, Sweden	4168
	Keltec Industries, Inc., Alexandria, Va.	5145
	Kirura Geophysical Observatory, Uppsala, Sweden	4498, 4499
	Kreuzrahmen, Germany	2137
	Kriegsmarine Werft, Kiel, Germany. German Governmental report	1429
	Laboratoire Central de Telecommunications, France	4636

L

	Laboratorium Electronische Ontwikkelingem Voor de Krijgsmacht, Netherlands	4571
Lavoie Labs	Lavoie Laboratories, Inc., Matawan-Freehold Road, Morganville, N.J. 07751	3042, 3063, 3121, 3136
	Lear, Inc., General Offices: Lear Jet Corporation, 8220 W. Harry, Wichita, Kansas 67201	3717, 3747, 3850, 3951
L.G.H. L.G.W.	Luftfahrtgeratewerk Hakenfelde, Berlin, Germany	1309, 1372, 1485
L.H.S.	Halle A.D. Saale Luftnachrichtenschule, German Governmental: WW II.	1044, 1243, 1258, 1344, 1695, 1699, 1754, 1880, 1888, 2139, 2211
	Library of Congress, Aerospace Information Division, Washington, D.C.	4964
	Lighthouse Conference, Berlin, Germany	954, 955
	Lincoln Laboratory, Massachusetts, Institute of Technology. See: Massachusetts Institute of Technology	
Little, Brown and Company	Little, Brown & Company, Inc., 34 Beacon St., Boston, Mass. 02108	4645

Litton Industries	Litton Systems, Inc., General Offices: 9370 Santa Monica Blvd., Beverly Hills, Calif. 90210	3788, 3824, 3899, 3905, 4402, 4460, 4478, 4516, 4577, 4607, 4665, 4672
Liverpool Eng. Soc. Trans.	Liverpool Engineering Society Transactions, Liverpool, England	2503
L.N.S.	German Governmental Agency	1318, 1555, 1676, 1937
	Lockheed Aircraft Corporation, General Offices: 2555 Hollywood Way, Burbank, Calif. 91502	3307, 4605
Loral Electronics Corporation	Loral Corporation, 688 White Plains Road, Scarsdale, N.Y. 10583	4552
Lorens Lorenze Berichte Lorenze-Berichte	Lorens-Berichte, Berlin, Germany	598, 891, 952, 1065, 1567, 2185
	Louisiana State University, Baton Rouge, La.	1767
Luftwissen	Deutsche Luftwacht, Ausgabe Luftwissen, Berlin, Germany	995
Lum. Elect. Lumiere Electr. La Lumiére Elec Lum. Élec.	Lumiére Electrique, Now: Revue generale de l'electricite, Paris, France	48, 73, 74, 80, 86, 121

M

	Machine Design, Penton, Publishing Co., Penton Bldg., Cleveland, Ohio 44113	4424
	Magnavox Company, General Offices: 2131 Bueter Road, Fort Wayne, Ind. 46805	3446, 3481, 3733
	Magnetron Magazine, Address: Unknown	2404
	Maguire Industries. See: General Electronic Industries	
Mallory, P. R., and Company P. R. Mallory and Company	P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis, Ind. 46201	4102, 4163, 4289, 4534
Manchester Mem. Phil. Soc.	Memoirs and Proceedings of the Manchester Literary and Philosophical Society, 36 George St., Manchester, England	949
Mar. Eng. Mar. Engr. and Naval Architect	Marine Engineer (and Naval Architect-and Motorship Builder), London, England	2591, 3736
Mar. Eng. and Shipg. Age	Address Unknown	506
Mar. News	Address Unknown	261, 461, 661
Mar. Rev. Marconi Rev. Marconi Review Marconi Revue	Marconi Review, Marconi's Wireless Telegraph Company, Marconi House, Chelmsford, England	507, 581, 591, 615, 623, 642, 655, 678, 716, 726, 773, 804, 805, 822, 829, 868, 914, 928, 983, 1081, 1124, 1151, 1181, 1599, 2074, 2143, 2187, 2575, 2629, 2675, 2894, 2918, 2921, 2948, 3094, 3144, 3229, 3258, 3314, 3329, 3337, 3380, 3409, 3627, 3819, 4109, 4120, 4121, 4122, 4123, 4200, 4201
	Marchand Electronic Laboratories	4789
Mariul Luftf. Ruridschau	Address Unknown, Germany	5961
Martin Company Martin Marietta Corporation	Martin Marietta Corp., 277 Park Ave., New York, N.Y. 10017	4105, 4137, 4138, 4790
Massachusetts Institute of Technology, Radiation Laboratory Report Mass. Inst. Tech (M.I.T.) Mass. Inst. Tech. Lincoln Laboratory	Massachusetts Institute of Technology, Cambridge, Mass.	1292, 1345, 1873, 2226, 2646, 2657, 2672, 3513, 4068, 4432, 4912
	Mauer, J. A., Incorporated. Status and address: Unknown	2444
	McGraw-Hill Book Company, New York, N.Y.	4171, 4183, 5037, 5079
	Mechanical Engineering, American Society of Mechanical Engineers, 345 E. 47th St., New York, N.Y. 10017	539

	Melpar, Inc., General Offices: 7700 Arlington Blvd., Falls Church, Va. 22042	3131, 3137, 3156, 3162, 3181, 3182, 3188, 3190, 3204, 3206, 3208, 3213, 3237, 3268, 3272, 3297, 3308, 3316, 3388, 3411, 3743, 4024, 4238
	Messerschmitt, Germany: Company report.	1911, 2212
Met. Mag.	Meteorological Magazine, H.M.S.O. Atlantic House, Holborn Viaduct, London, EC1, England	2813, 2879
Microwave Engineering Labs.	Melabs, 3300 Hillview Ave., Palo Alto, Calif. 94304	4103, 4148, 4242, 4336
	Microwave Radiation Company, Incorporated, Gardena, Calif.	3916
	Midwest Radio Corporation, Cincinnati, Ohio	1525, 1700
Minneapolis-Honeywell Regulator Company	Honeywell, Inc., General Offices: 2701 4th Ave., South, Minneapolis, Minn.	1960, 5089
Minnesota Museum Nat. Hist.	University of Minnesota, Minneapolis Museum of Natural History, 17th & University Ave., [illegible]., Minneapolis, Minn.	4764, 4769
	Mitre Corporation, Bedford, Mass.	5059
Mitt. Aeron. Obs. Lindeburg Mitt. Aeron. Obs. Lindeberg	Mitteilungen des Aeronautischen Observatoriums, Lindenberg, Germany	425, 468, 540
	Motorola, Inc., General Offices: 9401 W. Grand Ave., Franklin Park, Ill. 60131	4020, 4044
	Motorship. Now: Marine Engineering/Log, Simmons-Boardman Publishing Corp., 30 Church St., New York, N.Y. 10007	383, 2576
	Mullard Radio Valve, Limited, London, England	1582, 3505
Mullard tech. Commun.	Mullard Technical Communications, Mullard, Ltd., London 1, England	4370

N

N.V.K.	Nachrichtenmittleversuchs Rommando, Kiel. German Governmental Department, WW II.	2173
N.V.W.	German: Unknown	1807
N.Z.J. Sci. Tech.	New Zealand Journal of Science and Technology, Department of Scientific and Industrial Research, Box 8018, Wellington, New Zealand	3689
Nachrichtentechnik	Nachrichtentechnik-VEB, Verlag Technik Oranienburger Str. 13/14, Berlin, C2, Germany	4095, 4214, 4377, 4383, 4386, 4619
Nachr-Tech. Nachrichtentech. Z., (N.T.Z.) Nachrtech. Z. NTZ-Nachr.-Tech. Z NTZ (CJ)	Nachrichtentechnische Zeit chrift, Friedr Vieweg, Postfach 185, Braunschweig, Germany	3582, 3592, 3602, 3610, 3618, 3620, 3674, 3701, 3738, 3739, 3765, 3777, 3960, 4097, 4112, 4190, 4232, 4475, 4754, 5088
NASA	National Aeronautics and Space Administration, Washington, D.C. See: U.S. Governmental Agencies	
Nat. Res. Council of Canada Canadian National Research Council	National Research Council of Canada, Ottawa, Canada	1286, 1658, 1773, 1882, 2288, 3068, 3767, 4014, 4050, 4052, 4360, 4361, 4435, 4438, 4914, 5027
	National Electric Machine Shops, Washington, D.C.	1761
	National Simplex Bludworth, Inc., New York, N.Y.	1360
	Natural Science and Medicine in Germany. German address: Unknown	3333
	Nature, MacMillan, St. Martin's St., London, WC2; St. Martin's Press, 175 Fifth Ave., New York 10, N.Y.	282, 357, 358, 410, 423, 435, 463, 471, 478, 491, 493, 510, 585, 611, 616, 659, 918, 987, 1059, 1129, 1139, 1157, 2741, 2994, 3006, 3170, 3298, 3468, 3500, 3628, 3666, 3835, 3881, 3887, 3896, 3945, 4101, 4128, 4132, 4136, 4355, 4481, 5096

Naut. Gaz	Nautical Gazette, New York, N.Y.	2553, 2816
	The New American Library, Incorporated, Signet Book, New York, N.Y.	5081
	New Hampshire University, Durham, N.H.	4933
	New Mexico University, Albuquerque, N.M.	4882, 5050
	New York University, New York, N.Y.	3727, 3770, 3879, 3917, 3955, 4011, 4161, 4401, 4461, 4482, 4515, 4597, 4775, 4804, 5192
New Zealand J. Sci.	New Zealand Journal of Science, Department of Scientific and Industrial Research, Box 8018, Wellington, New Zealand	3839
Note d. Etabl. Central d. Mat. Rad.	Note de l'Etablissement Central du Materiel Radiophonique, France	129
	Nuovo Cimento, Societa Italiana di Fisica, Publication address: Nicola Zanichelli, via Irnerio 34, Bologna, Italy	3562, 4047
Nuovo cimento Suppl.	Nuovo Cimento Supplement. Supplemento al Nuovo Cimento. See: Nuovo Cimento	3567

O

	Ivan Obilensky, Inc., New York, N. Y.	4640
Ohio State Univ.	Ohio State University, Columbus, Ohio	1312, 1724, 2326, 2443, 2606, 2700, 2705, 2962, 3022, 3070, 3134, 3155, 3224, 3248, 3295, 3387, 3391, 3435, 3502, 3642, 3790, 3827, 3852, 3930, 3999, 4012, 4422, 4458, 4497, 4546, 4596, 4624, 4659, 4722, 4824, 4865, 4867, 4962, 5012
O.K.H.	Oberkommando des Heeres., Berlin (German Governmental)	1583
Oklahoma A. and M. College	Oklahoma A. and M. College, Stillwater, Oklahoma	3710
O.K.M.	Oberkommando der Marine (German Governmental)	1262, 1721
O.L.G.	Oberkommando der Luftwaffe, Generalnachrichtenfuhrer (German Governmental)	1954
Onde Elec. L'Onde Electrique Onde. Elec. Onde Elect.	L'Onde Electrique, Société Francaise des Electroniciens et des Radioélectriciens, 10 Avenue Pierre-Larousse, Malakoff (Seine). Publisher: Editions Chiron, 40 rue de Seine, Paris 6, France	240, 252, 253, 261, 273, 283, 297, 298, 304, 318, 384, 413, 440, 454, 479, 490, 492, 494, 527, 535, 553, 557, 558, 570, 579, 586, 592, 614, 624, 625, 656, 658, 665, 675, 686, 692, 697, 706, 738, 743, 813, 815, 818, 819, 828, 845, 872, 876, 877, 883, 916, 922, 967, 971, 1053, 1098, 1138, 1142, 2558, 2814, 2991, 3000, 3043, 3242, 3483, 3497, 3709, 3721
	Oxford University Press, London, England	3, 3106

P

Pacific Mar. Rev. Pac. Mar. Rev.	Pacific Marine Review, San Francisco, Calif. Ceased publication: 1950.	245, 274, 276
	Page Communications Engineers, Inc., Washington, D.C.	5040, 5056
	Pan American World Airways, Inc., Tucson, Ariz.	5100, 5121
	Paris University, Paris, France	4907
	Pennsylvania State University, University Park, Pa.	3447, 3454, 3473, 5142
	Pergamon Press, New York and Oxford, England	4166, 4167, 4173, 4176, 4180
	Philco Corporation, Western Development Laboratories, Palo Alto, Calif.	4073
	Philco Scientific Laboratory, Division of Philco Corp., Blue Bell, Pa.	4879

Philips Res. Rep.	Philips Research Reports, Centrex Publishing Company, Eindhoven, Netherlands	2433, 2578, 2938, 3027
Philips Techn. Rev.	Philips Technical Review. See: Philips Research Reports	1058, 2495, 3294, 3469
Phil. Mag.	Philosophical Magazine, Taylor and Frances, Red Lion Court, Fleet St., London, EC4, England	16, 34, 108, 111, 131, 153, 209, 250, 262, 319, 887, 2554, 4064, 4088
Phil. Trans. Roy. Soc. London	Philosophical Transactions of the Royal Society of London, Series A, Burlington House, London, W1, England	3684, 3766
Phys. Rev. Phys. Review Proc. Amer. Phys. Soc.	Physical Review, American Institute of Physics, Inc., 335 E. 45th St., New York, N.Y. 10017	149, 151, 228, 290, 385, 409, 731, 960, 1217, 1647, 2155, 2620, 2707, 2943, 3049
Physica Physica 's Grav.	Physica, s' Gravenhage. Same as: Physica; Physica Foundation, Amsterdam, Netherlands	1497, 1559, 2426
Phys. Zeit. Phys Zeitschr. Phys. Zeits.	Physikalische Zeitschrift, Leipzig, Germany	7, 10, 17, 30, 35, 85, 420
	Pickard and Burns, Incorporated, Needham, Mass.	3442, 3904
	Point to Point Telecommunications, Communications Division, Marconi's Wireless Telegraph Company, Chelmsford, England	5154
	Popular Aviation. Now: Flying, Ziff Davis Publishing Co. 1 Park Ave., New York, N.Y. 10016	504, 519
	Post Office Electrical Engineers' Journal, GPO 2-12, Gresham St., London, EC2, England	622, 1097, 1224, 1326, 1418, 1566, 1632, 1649, 1750, 1797, 1950, 1953, 2079, 2080, 2216, 4208
Prace Inst. Tele-i Radiotech.	Prace Instytutu Tele-i Radiotechnicznego, Instytut Tele- i Radiotechniczny, ul. Ratuszowa 11, Warsaw 4, Poland	5094
	Priborostroeni, Editorial address: ul. Gor'kovo b. 6, Moskva K-9. A translation is published as: Instrument Construction.	3987
Pribory i Tekh. Eksper	Pribory i Tekhnika Eksperimenta, Agent: Mezhdunarodnaya Kniga, Moskva. A translation is published as: Instruments and Experimental Techniques.	3861, 3864
Proc. Amer. Phys. Soc.	See: Physical Review	
Proc. I.E.E.	Institution of Electrical Engineers Proceedings, Savoy Place, London, WC 2, England. Formerly divided into Parts A, B, and C. Now combined - See:	3023, 3056, 3119, 3398, 3436, 4581, 4835, 4839, 4864, 4866, 4877, 5103, 5109, 5161, 5202, 5204, 5206, 5211, 5219
Proc. IEE Part III	Institution of Electrical Engineers Proceedings, Part III, Savoy Place, London, WC 2, England	2191, 2992, 3040, 3044, 3118, 3139, 3142, 3196, 3275, 3341, 3375, 3378, 3422, 3445, 3676
Proc. IEE Part IV	Institution of Electrical Engineers Proceedings, Part IV, Savoy Place, London, WC2, England. Monogram Section.	3240, 3305
Proc. IEE Part A	Institution of Electrical Engineers Proceedings, Part A, Savoy Place, London, WC2, England. Formerly: Part II.	4470
Proc. IEE Part B	Institution of Electrical Engineers Proceedings, Part B, Savoy Place, London, WC2, England. Formerly: Part III.	3427, 3475, 3517, 3518, 3519, 3520, 3581, 3597, 3606, 3608, 3694, 3804, 3818, 3842, 3843, 3846, 3953, 4016, 4142, 4245, 4249, 4250, 4257, 4259, 4264, 4343, 4344, 4507, 4536, 4537, 4602, 4643
Proc. IEE Part C	Institution of Electrical Engineers Proceedings, Part C, Savoy Place, London, WC2, England. Formerly: Part IV.	3600, 3622, 3624, 3924, 3925, 4666
Proc. Inst. Radio Engrs. Proc. IRE Institute Radio Eng Inst. Radio Eng., Proc. I.R.E. Proc.	Proceedings of the Institute of Radio Engineers. Changed title to: IEEE Proceedings, Institute of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y. 10021	105, 125, 126, 127, 128, 133, 143, 150, 166, 177, 193, 195, 196, 201, 243, 246, 248, 275, 299, 334, 335, 336, 346, 351, 364, 392, 393, 408, 472, 505, 509, 516, 517, 525, 534, 554, 559, 567, 576, 577, 580, 587, 588, 589, 590, 603, 604, 605, 608, 610, 619, 620, 626, 673, 676, 677, 683, 685, 687, 710, 713, 723, 730,

Proc. Inst. Radio Engrs. (Cont'd)	Proceedings of the Institute of Radio Engineers, (Cont'd)	737, 739, 768, 769, 770, 774, 783, 787, 790, 792, 795, 806, 807, 814, 816, 821, 823, 827, 862, 873, 892, 926, 927, 931, 941, 964, 972, 976, 984, 992, 1002, 1003, 1007, 1013, 1014, 1046, 1056, 1064, 1075, 1123, 1127, 1153, 1170, 1172, 1178, 1180, 1194, 1205, 1227, 1277, 1284, 1298, 1375, 1407, 1416, 1629, 1809, 1859, 1943, 2033, 2053, 2076, 2108, 2290, 2385, 2431, 2469, 2473, 2515, 2519, 2598, 2635, 2661, 2662, 2664, 2679, 2692, 2797, 2824, 2826, 2834, 2851, 2853, 2870, 2871, 2890, 2891, 2895, 2897, 2906, 2910, 2919, 2920, 2928, 2935, 2960, 2977, 3003, 3019, 3024, 3031, 3058, 3071, 3074, 3104, 3113, 3124, 3125, 3138, 3141, 3145, 3152, 3157, 3165, 3200, 3215, 3217, 3226, 3233, 3254, 3266, 3303, 3319, 3331, 3355, 3363, 3372, 3389, 3390, 3406, 3444
Proc. IRE (Australia) Proc. Instn. Radio Engrs. Australia	Proceedings of the Institution of Radio Engineers, Australia. Title changed to: Proceedings of the Institution of Radio and Electronics Engineers Australia. Science House, 157 Gleucester St., Sydney, Australia	2897, 2910, 3019, 3201, 3270, 3321, 3778, 3986, 4317, 4391, 4453, 4878
Proc. Mar. Rev.	Marine Review, Cleveland, Ohio. Ceased publication in 1935.	462
Proc. Nat. Acad. Sci.	Proceedings National Academy of Sciences. 2101 Constitution Avenue, Washington, D. C. 20418	2720
Proc. Nat. Electronics Conference (Chicago) NEC Chicago Proc. NEC (Chicago) Proc. NEC Proc. Nat. Electronics Conf.	Proceedings of the National Electronics Conference. National Electronics Conference, Inc., McCormick Place, Chicago, Illinois. Also available: University Microfilms, Inc., 313 North First Street, Ann Arbor, Michigan.	2680, 2978, 3090, 3079, 3147, 3174, 3259, 3262, 3318, 3542, 3543, 3636, 3637, 3760 3946, 3971, 3978, 4419.
Proc. Nat. Inst. Sci. India	Proceedings of the National Institute of Sciences of India, Mathura Road, New Delhi.	4647
Proc. Phys. Soc. Phys. Soc. Proc.	Physical Society Proceedings, Institute of Physics and the Physical Society, 47 Belgrave Square, London, SWI, England	34, 49, 112, 260, 689, 809, 810, 889, 1310, 2562, 3108, 3109, 3579, 3593
Proc. of Radio Club of America	Proceedings of the Radio Club of America, New York, 11W. 42nd Street, New York, N. Y. 10036	1840, 3176
Proc. Roy. Soc. Roy. Soc. Proc. Proc. Roy. Soc. Ser. A Proc. Roy. Soc., Series A Proc. Roy. Soc. A	Proceedings of the Royal Society of London, Series A. Mathematical and Physical Sciences, Burlington House, London, W1, England	8, 9, 15, 96, 131, 134, 262, 338, 366, 388, 422, 457, 467, 607, 719, 763, 865, 884, 890, 939, 973, 1270, 2399, 3219, 3279, 3803, 4133
Przeglad Telekom.	Przeglad Telekomunikacyjny, Editorial address: ul Barbary 2, Warsaw, Poland	3260, 3335

Q

	Q.S.T., American Radio Relay League, Inc., 225 Main St., Newington, Conn. 06111	854, 1230, 1273, 2106, 2520, 2619, 3076, 3105, 3863, 4326, 4342
QST Francais QST Francais et Radioélectricité Réunis	Q.S.T. francis (dt Radioelectricite). Changed title to. Radioelectricite et Q.S.T., Paris, France. Ceased publication: 1931.	442, 444, 450, 538, 652, 663
Quart. Appl. Math.	Quarterly of Applied Mathematics, Box 1885, Brown University, 180 George St., Providence 12, R.I.	4210
Quar. J. Mech appl. Math.	Quarterly Journal of Mechanics and Applied Mathematics, Oxford University Press, Amen House, Warwick Square, London, EC4, England	3193
Quar J.R. Met. Soc.	Quarterly Journal of the R. Meteorological Society, Royal Meteorological Society, Quarterly Journal, 49 Cromwell Road, London, SW7, England	3634

R

RCA Rev.	RCA Review, RCA Laboratories, Princeton, N. J.	959, 1328, 2555, 3276, 4089, 4251, 4261

RCA Victor Company RCA, Victor Division RCA Manufacturing Company RCA Defense Electronic Products, Camden, N. J. RCA Victor, Ltd.	Radio Corporation of America, General Offices: 30 Rockefeller Plaza, New York, N. Y. 10020	766, 767, 785, 830, 834, 835, 836, 896, 897, 899, 986, 989, 1145, 1146, 1147, 1203, 1255, 1295, 1296, 1323, 1427, 1518, 1556, 1638, 1663, 1712, 1735, 1801, 1817, 2025, 2032, 2146, 2197, 2201, 2256, 2993, 4805, 4892
	Radio, London, England	530, 2429, 2467, 2523, 2563, 2571
	Radio Amateur News, Present title: Elettronics World, Ziff Davis Publishing Co., New York, N. Y. See also: Radio News	138
Radio B'cast	Radio Broadcast, Garden City, New York, N. Y. Ceased publication: 1930	238
	Radio Craft. Present title: Radio-Electronics -see: Gernsback Publications, Inc., 154 W. 14th St., New York, N.Y. 10011	2654
Radio Digest Illust	Radio Digest Illustrated. Status and Address: Unknown	230
	Radio-Electronics, Gernsback Publications, Inc., 154 W. 14th St., New York, N.Y. 10011	3646
Radio Electronic Engr.	Radio and Electronic Engineer, 9 Bedford Square, London, WC1, England	4842, 5029
Radio Electronic Engng.	Radio Electronic Engineering. Present title: Electronics World (-See:) Ziff Davis Publishing Co., New York, N.Y.	2976, 3246
Radio Eng.	Radio Engineering. Changed title to: Communications, New York (1937-1949). Television Engineering (1950-1952), Communication Engineering (1952-1959). No longer published.	702
Radio Engineering	Radio Engineering and Electronic Physics, Institute of Electrical and Electronic Engineers, Box A, Lenox Hill Station, New York 21, N.Y. A translation of Radio tekhnika i Elektronika.	3813, 4055
Radio Franc	La Radio francaise, Paris, France	3245
	Radio Navigational Instrument Corporation, New York, N.Y.	1257
	Radio News, Present title: Electronics World, Ziff Davis Publishing Company, New York, N.Y. See also Radio Amateur News.	2579, 2830
Radio Research, Japan Reports Rep. of Rad. Res. in Japan Rep. of Rad. Research in Japan Radio Research Japan	Report of Radio Research in Japan, Tokyo, Japan	672, 677, 733, 771, 793, 794, 826, 831, 1079, 1092, 4430
Radio Research Laboratory RRL	University of Illinois, Department of Electrical Engineering, Radio Research Laboratories, Urbana, Ill. See also: University of Ill.	1654, 1800, 1837, 1892, 1893, 1898, 1906, 1910, 1930, 1931, 1973, 1975, 1979, 1990, 1997, 2001, 2017, 2023, 2042, 2063, 2081, 2084, 2087, 2091, 2095, 2096, 2134, 2135, 2148, 2154, 2175, 2183, 2195, 2198, 2204, 2219, 2230, 2234, 2267, 2268, 2274, 2278, 2281, 2285, 2289, 2320, 2334, 2363, 2394, 2413, 2415, 2416, 2434, 2435, 2450, 2479, 2526
Radio Rev.	Radio Review, London, England	148, 156, 167, 168, 169, 182, 183, 184, 187, 191, 194, 197, 198, 200, 208, 211, 215, 219, 222, 266
	Radio Science. Formerly: Journal of Research, National Bureau of Standards, -See:	
Radio Televis. News	Radio and Television News. Present title: Electronics World, Ziff Davis Publishing Co., New York, N.Y. See also: Radio Amateur News and Radio News.	2976
Radioelect Radio Electricite Radio-électricité	Radioelectricite, Paris, France. Changed title to: Q.S.T. francais (et Radioelectricite). Ceased publication: 1931.	174, 225, 295, 308
Radiomarine Corporation of America	Radio Marine Corporation of America, New York, N.Y.	1200, 1717, 1851

Radiotek and Elek	Radiotekhnika i Elektronika, Akademiya Nauk SSR, Leninskii prosp. 14, Moskva. A translation is published as: Radio Engineering and Electronic Physics (USA).	3651, 3762, 3776, 3780, 3857, 3989, 3990, 4065, 4290, 4526, 4668, 4819, 5005, 5047, 5180, 5208
	Radiotekhnika, Editorial address: ul. Gor'kogo 7, Moskva K-9. A translation is published as: Telecommunications and Radio Engineering, Part 2: Radio Engineering (USA).	2743, 2898, 2973, 3714, 3797, 3810, 3832, 3928, 3968, 4061, 4117, 4154, 4185, 4194, 4198, 4240, 4265, 4314, 4318, 4350, 4375, 4649, 4669, 5126, 5151, 5172
	Radioteknicheskiye Sredstva Morskogo Sudovozhdeniya	3575
	Rand Corporation, Santa Monica, Calif.	3479
	Reconnaissance Systems Laboratories, Mountain View, Calif.	4858, 4869
	Regia Academia Navale, (Complete title Unknown) Address: Unknown	704
	Rensselaer Polytechnic Institute, Troy, New York, N.Y.	3920, 4661
Rep. Ionosph. Res. Japan Rep. Ionosphere Res. Japan Rep. Ionosphere Research Japan Rep. Ionosphere Space Res. Japan	Report of Ionosphere and Space Research in Japan, Science Council of Japan, Ueno Park, Japan	3466, 3467, 3489, 3571, 3665, 3696, 3703, 3755, 3886, 4066, 4096, 4327, 4451
Rep. Progr. Phys.	Reports on Progress in Physics, Institute of Physics and the Physical Society, 47 Belgrave Square, London SW1, England	3573
Rep. Res. Inst. Elect. Commun. Tohoku Univ.	Reports of the Research Institute of Electrical Communication, Tohoku University. A Section of Science Reports of the Research Institutes, Tohoku University. Series B (Technology), Tohoku University, Sendai.	3652, 3749, 3750, 4768
Report of the Aero. Research Institute, Tokyo	Report of the Aeronautical Research Institute Tokyo University, Tokyo, Japan. Ceased publication: 1945.	1143
	Republic Aviation Corporation, Farmingdale, New York, N.Y.	4762
Rev. Electrique	Revue electrique. Now: Revue generale de l'electricite, Paris, France	101
	Revista General de Marina, Madrid, Spain	709
Rev. Gen. d'El. Rev. Gen. d'Elec. Rev. Gen. Elect.	Revue Générale de l'Électricité, 12 Place Henri-Bergson (ex-Place de Laborde), Paris 8, France. See: Rev. Electrique	269, 653, 715, 755, 863, 898, 930, 942, 977, 1005, 1032, 1035
Rev. Gen. d. Science	Revue generale des sciences pures et appliques, Paris, France	76
Rev. Radio Res. Lab.	Revue of Radio Research Laboratory, Tokyo, Japan	4815
Rev. Sci. Instr.	Review of Scientific Instruments, American Institute of Physics, 335 E. 45th St., New York, N.Y. 10017	1241, 4837
Rev. Scientifique	Revue Scientific (Revue rose), Paris, France	390
Rev. tech. C.F.T.H. Rev. Tech. Comp. Franc.	Revue Technique de la Compagnie Francaise Thompson-Houston, 173 Blvd. Haussman, Paris 8, France	1854, 4408
Revue d. Armee d. Air.	Revue de l'Armee de l'Air, France	812, 1055
	Revue generale de l'electricite, Paris, France. See: Lum. Elect. and Rev. Electrique	
	Revue Industrielle, Paris, France	690
Ricera Scientifico	Ricerca Scientifica, Parte I: Revista, Consiglio Nazionale Delle Ricerche, 7 Piazzale Delle Scienze, Roma, Italy	1156, 3974, 4462
	Rivista Aeronautica, Rome, Italy	919
	Rivista Marittima, Rome Italy	380
R.L.M. R.M.L.	Der Reichsminister der Luftfahrt und Oberbefehlshaber der Luftwaffe. German Governmental Report.	1128, 1444, 1449, 1626, 1678, 1679, 1752, 1853

Rohde & Schartz Mitt. Rohde u. Schartz Mitt.	Rohde und Schwarz Mitteilungen. Subscription address: R. Oldenbourg, Rosenheimerstrasse 145, Munich 8, Germany	3463, 4033, 4034
R.O.L.	Reich Luftfahrtministerium und Oberbefelshaber der Luftwaffe. German Governmental.	1450, 1451, 1751
Roy. Meteorolog. Soc., Journ.	Quarterly Journal of the Royal Meteorological Society, Cromwell Road, London, SW7, England	400
Rozprawy Elektro tech	Rozprawy Elektrotechniczne, Polska Akademia Nauk, Instytut Podstawowych Problemow Techniki. Subscription address: CKPW "Ruch", ul. Srebrna 12, Warszawa, Poland	5085
R.S.G.B. Bull.	Radio Society of Great Britain Bulletin, Little Russell St., London, WC1, England	2817
Rundfunktech Mitt. Rdfunktech. Mitt.	Rundfunktechnische Mitteilungen, Institut für Rundfunktechnik. Editorial address: Harvestehuder Weg 7, Hamburg 13, Germany	3786, 4114

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S. A. Internat. d. Teleg. s. Fil. H.V.E.	Full Name & Address: Unknown	946
S.A.M.	Siemens Apparate-Maschabau Gmb H., Germany	1057
	Sandia Corporation, Albuquerque, N.M.	4143
Sargent Company, E.M.	Sargent, E.M., Company, Oakland, Calif.	1207
Scanwell Labs., Inc.	Scanwell Laboratories, Inc., Springfield, Va.	4831
Schweiz. Arch. Angew. Wiss. Tech. Schweizer Archiv.	Schweizer Archiv. für angewandte Wissenschaft und Technik. Annales Suisses des Sciences Appliquées et de la Technique - Buckdruckerei Vogt-Schild, Solothurn	2634, 2857
	Science, American Association for the Advancement of Science, 1515 Massachusetts Ave., Washington, D.C. 20005	1222, 4707
	Science Abstracts (Sections A & B), Institution of Electrical Engineers, Savoy Place, London, WC2, England	254, 317, 357, 373, 374, 384, 406, 648, 703, 715, 719, 732, 735, 832, 1313, 1560
	Science and Culture, Indian Science News Association, 92 Acharya Prafullachandra Road, Calcutta 9, India	1237
La Science et la Vie	Science et Vie, 5 Rue de la Baume, Paris 8E, France	399
	Science Moderne, Paris, France	674
	Science News Letter, Science Service, Inc., 1719 N St. NW, Washington, D.C. 20036	1785
Sci. Rep. Res. Inst. Tohoku	Science Reports of the Research Institutes, Tohoku University. Series A Physics Chemistry and Metallurgy, Tohoku University, Sendai, Japan	3177, 3179, 3719
	Scientia Electrica, Birkhaeuser Verlag, Basel 10, Switzerland	4325
Sci. Am.	Scientific American, Scientific American, Inc., 415 Madison Ave., New York 10017	87, 2577, 5122
Sci. Am. Sup.	Scientific American Supplement, See: Scientific American	52, 68
	Scientific, Atlanta Inc., 3845 Pleasantdale Road, Atlanta, Geo. 30324	5044
	Seismological Society of America, Bulletin, Waverly Preso, Inc., Baltimore Maryland	5068
Semi-Conductor Products	Semiconductor Products and Solid State Technology, Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, Long Island, N. Y.	3937

	Servo Corporation of America, 111 New South Rd., Hicksville, N. Y. 11801	3685, 3745, 3921, 3965, 4048, 4354, 4420, 4496, 4510, 4547, 4618, 4634, 4680, 4860, 4994, 5051, 5108
Shipbldg. & Shipg. Rec.	Shipbuilding and Shipping Record, 33 Tothill St., Westminster, London, SW1, England	2406
	Shipping, Liverpool, England, (no longer published)	242
Siemens-Z	Siemens-Zeitschrift, Siemens-Schuckertwerke Aktien-gesellschaft, Postfach 8520, Erlangen 2. English translations of selected articles appear in: Siemens Review.	1484, 4229
Slaboproudy Obzor.	SlaboprodyObzor, Krakovska 8, Praque 1, Czechoslovakia	3328, 3393, 3395, 4252
	Smith, J. and H., Manufacturing Company, Newburgh, N. Y.	4307
	Smyth Research Associates, San Diego, Calif.	4932, 5165
Soc. Automotive Engrs.	Journal of the Society of Automotive Engineers (1917-1927), Now: S. A. E. Journal, Society of Automotive Engineers, 485 Lexington Avenue, N. Y. 10017	376, 1063
Soc. Franc. Élect. Bull. Soc. Franc. Elect. Soc. Fr. Elec. Bul.	Bulletin de la Société Francaise des Electriciens, 8-14 Ave. Pierre-Larousse, Malakoff (Seine), France	337, 515, 544, 636, 777
Soc. Internat. des Elect.	Bulletin de la Societe Internationale des Electriciens, Gauthier-Villars, Paris	38, 59
	Society of Naval Architects and Marine Engineers, 74 Trinity Place, N. Y. 10006	4726
	Southwest Research Institute, 8500 Culebra Road, San Antonio, Tex. 78206	3582, 3615, 3639, 3707, 3735, 3772, 3823, 3825, 3871, 3907, 3915, 3931, 3947, 4000, 4023, 4039, 4077, 4079, 4134, 4216, 4220, 4268, 4287, 4366, 4392, 4423, 4437, 4440, 4480, 4495, 4530, 4533, 4544, 4549, 4573, 4584, 4595, 4623, 4625, 4635, 4658, 4662, 4692, 4693, 4695, 4710, 4720, 4729, 4743, 4774, 4782, 4802, 4803, 4825, 4827, 4857, 4859, 4871, 4873, 4906, 4910, 4911, 4935, 4943, 4966, 4967, 4969, 4970, 4997, 5006, 5020, 5021, 5022, 5038, 5041, 5055, 5070, 5071, 5099, 5117, 5127, 5128, 5146, 5177, 5193, 5196
Sovetskoye Radio	Sovetskoye Radio i Televidenie, Moscow, USSR	4464, 4644
	Space/Aeronautics, Conover-Mast Publications, Inc., 205 E 42nd St., N. Y. 10017	4411
	Space-General Corporation, 9200 East Flair Drive, El Monte, Calif. 91731	4928
	Space Research, North-Holland Publishing House, Amsterdam, Netherlands	4165
	Space Technology Laboratories, Inc., Redondo Beach, Fla.	4719
	Sperry Gyroscope Company, Subsidiary of: Sperry Rand Corporation, General Offices: 1290 Avenue of the Americas, New York City	1201, 4674, 4833
	Standard Telephone and Cables, Ltd., London, England	1383, 1385, 1396, 1434, 1747, 1978, 2067, 2099
	Stanford Research Institute, Menlo Park, Calif.	3065, 3269, 3324, 3368, 3416, 3420, 3421, 3452, 3486, 4373, 4429, 4477, 4525, 4564, 4582, 4614, 4648, 4667, 4709, 4733, 4797, 4813, 4832, 4841, 4920, 4953, 4976, 5048, 5201
	Stanford University, Stanford, Calif.	2019, 3523, 3630, 3758, 3868, 4076, 4078, 4162, 4358, 4439, 4457, 4551, 4701, 4899, 5007, 5124
	Stanford University Press, Menlo Park, Calif.	5077
Stewart Warner Corp.	Stewart Warner Electric Company, 1826 Diversey Blvd, Chicago, Ill. 60614	3309, 3440

	Stoddard Aircraft Radio Company, 2045 West Rosecrans Avenue, Gardena, Calif. 90249	4284
	Submarine Signal Company, Boston, Mass	2361
	Sylvania Electric Products, Inc., Mountain View, Calif. Division of: General Telephone & Electronics Corporation, General Offices: 730 Third Avenue, New York, N. Y. 10017	4035, 4783, 4885, 4894, 4903, 4925, 4941, 4965, 5014, 5023, 5025, 5113
	Sylvania Electronic System--West, Electronic Defense Laboratories, Mountain View, Calif. Division of: General Telephone & Electronics Corporation, General Offices: 730 Third Ave. New York, N. Y. 10017	4279
	Sylvania Technologist, Flushing, N. Y.	3151, 3516
Symetrics Engineering Corp.	Symetrics Engineering Corp. of Florida, 225 S. Patrick Drive, Satellite Beach, Fla. 32937	5097
	Syracuse University, Syracuse, N. Y.	2958, 2967, 3036, 3064, 3111, 3130, 3140, 3192, 3222, 3227, 3228, 3252, 3293, 3331, 3754, 5163, 5181
	Systems, Inc., Orlando, Fla.	4308, 4427, 4689

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Tech. Mitt. PTT	Technische MitteiLungun PTT., (Bollettino Tecnico PTT) – Schweizerische Post-, Telephon-und Telegraphen-Betriebe, Speichergasse 6, Bern, Switzerland	3330, 4174
Tech. Mitt. RFZ	Technische Mitteilungen des Rundfunk-und Fernsehtechnische Zentralamtes (RFZ), Agastrasse, Berlin-Adelshof	5178
La Tech. Mod. Technique Modern	Technique Moderne, revue universelle des sciences appliquees à l'industrie, 92 Rue Bonaparte, Paris 6E, France	75, 86, 662
Tech. wet. Tijdschr	Technisch-Wetenschappelijk, Now: Ingeniersblad, Antwerp, Belgium	2186
	Technical Review Group, Menlo Park, Calif.	4985, 4999, 5010
	Technische Hochschule, Munich, Germany	4807
	Technical University, Copenhagen, Demark	4787
	Teknisk Tidskrift – Svenska Teknologföreningen, Box 841, Stockholm 1, Sweeden	2884
Tekn. Ukeblad	Teknisk Ukeblad., Kronprinsensgt, 17, Oslo, Norway	4425
Telecom.	Telecommunication Journal, Union Internationale des Telecommunications U. I. T., Place des Nations, Geneva, Switzerland	1204
Telecommunications	Telecommunications and Radio Engineering, Part 1: Institute of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York 21, N. Y. See: Translation of Elektrosvyaz	3809
Telefunken Hausmitt	Telefunken Hausmitteilungen, Berlin Germany	1182, 1199
Telefunken, Zeit Telefunken Telefunken ZTG	Telefunken Zeitung, Ernst-Reuten, Platz 7, 1 Berlin 10	94, 430, 431, 432, 433, 434, 497, 701, 849, 856, 866, 911, 948, 994, 1031, 1052, 1069, 1074, 1083, 1411, 1436, 1441, 1447, 1448, 1464, 1465, 1476, 1477, 1481, 1507, 1553, 1568, 1585, 1657, 1677, 1715, 1716, 1719, 1753, 1768, 1780, 1850, 1912, 2006, 2070, 2103, 2140, 2164, 2341, 2590, 2717, 3216, 3218, 3274, 3277, 3278, 3423, 3433, 3558, 3604, 3645, 3885, 3891, 3892, 4332, 4601, 4604, 4919, 4921
Teleg. & Teleph. Age	Telegraph (and Telephone) Age, New York, N. Y.	502, 649
Telegraphen u. Fernsprech-Technik	Telegraphen-u. Fernsprech (-Funk und Fernseh) technik, Berlin, Germany	210

Telegraphentechn. Reichsamt.	German: Unknown	255
Tele-Tech.	Tele-Tech and Electronic Industries. Now: Electronic Industries. -See:	2721, 2839, 3292, 3403, 3478, 3530, 3601
	Teleteknik, Post and Telegraph Office and Concessionary Telephone Companies in Demark Kannikegade 16, Aarhus C, Denmark	4840
	Television, Television Magazine Corp., 444 Madison Ave., New York City 10022	529
Terr. Mag.	Terrestrial Magnetism and Atmospheric Electricity, (1896-1949). Now: Journal of Geophysical Research. -See:	326, 358, 888
Tevar	German: Unknown	1479
Thompson Ramo Woolridge, Inc. Ramo-Wooldridge Corporation	Thompson Ramo Wooldridge Corporation, Los Angeles, Calif.	3731, 3744, 3789, 3836, 4040, 4335, 4337, 4512, 4735
Tijdschr. ned. Radiogenoot.	Tijdschrift van het Nederlands Elektronica - en Radiogenootschap, Editorial address: Prinses Marijkelaan 7, Leidschendam. Formerly: Tijdschrift van het Nederlands Radiogenootschap	3358, 3611, 3970, 4763
Times Trade and Eng. Supp.	Times Trade & Engineering (Supplement). Changed Title to: Times Review of Industry. Now: Times Review of Industry and Technology, Times Publishing Co., London, England	279, 482, 511, 514
	Torrechiaruccia, S. Marinella, Rome, Italy	3922
Trans Amer. Inst. Elect. Engrs. Trans. AIEE	Transactions of the American Institute of Electrical Engineers, New York City. See: AIEE and Proc. IRE	3643
Trans. Amer. Geophys. Union	Transactions of the American Geophysical Union, 1145 Nineteenth St., N. W., Washington, D.C. 20036	751, 3859
Trans. Dan. Acad. Tech. Sci.	Transactions of the Danish Academy of Technical Sciences, Copenhagen, Denmark	3093
Trans. IEEE	See: IEEE Trans.	
Trans. Roy. Soc. (London)	Proceedings of the Royal Society of London, Burlington House, Piccadily, London W1, England	2
Trans. S. African Inst. Elect. Engrs.	Transactions of the South African Institute of Electrical Engineers, Kelvin House, Marshall and Hollard Streets, Johannesburg, Africa	1614
TRG-West, Division of TRG, Inc.	TRG., Inc., Subsidiary of: Control Data Corporation, Melville, New York	4696, 4811, 4890

U

U.R.S.I. Proc. of 1938 Assembly Fasc. 1 U.R.S.I. Proc. IX the Gen. Assembl.	Union Radio Scientifique Internationale, 7 Place Emile Danco, Belgium, Brussels	1114, 3089, 3091
	Underwood Corporation, Canoga Division, Fort Walton Beach, Fla.	4239
	L'Union Internationale des Telecommunications, Geneva, Switzerland	4781
	United Air Lines, Inc., General Offices: P.O. Box 8800, Chicago, Ill. 60666	1228, 1708
U.S. Armed Forces	United States Armed Forces	
U.S. Air Force	United States Air Force	
	Aerospace Technical Intelligence Center, Wright-Patterson AFB, Ohio	4054
Air Force Inst. of Tech.	Air Force Institute of Technology, Wright-Patterson AFB, Ohio	5166
	Air Proving Ground Command	3086, 3296
	Air Research and Development Command	3690, 4431

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	Air Technical Intelligence Center	3792
	Aircraft Radio Laboratories	1900
	Bureau of Aeronautics	2887
	Cambridge Research Center, Bedford, Mass.	3522, 3524, 3848, 3878, 4030
	Cambridge Research Laboratories, Bedford, Mass.	4151, 4164, 4455, 4795, 4918, 4930, 4936, 5149
	Communications Services, Scott AFB, Ill.	4889
	Foreign Technology Division, Air Force Systems Command, Wright-Patterson AFB, Ohio	4748, 4870, 4905
	Rome Air Development Center, Griffiss AFB, N. Y.	3833, 3877, 4046, 4140, 4215, 4852, 4898, 5136
	School of Aviation Medicine, Brooks AFB, Tex.	3180
	Systems Engineering Group, Research and Development Division, Wright-Patterson AFB, Ohio	5035, 5065
	Tactical Air Command, Langley AFB, Fla.	5042
WADC	Wright Air Development Center, Wright-Patterson AFB, Ohio	3353, 3482, 3535, 4124, 4509
	4750th Test Squadron	4936
U.S. Army	United States Army	
ADI	Air Material Command, Air Documents Division. (Depository of ADI documents carried in Pacific Aeronautical Library, Hollywood, California, and may also be available through U.S. Department of Commerce, Office of Technical Services, Washington, D.C. Abstracts carry this index number where applicable.)	
	Air Missile Command, Redstone Arsenal, Huntsville, Ala.	4885
AMC Intelligence	Air Material Command, Engineering Division, Wetson Laboratories, Intelligence Division	2815, 2876, 2889, 2915, 2962, 3072
	Army Air Force, miscellaneous	627, 628, 629, 630, 631, 632, 634, 695, 786, 1423, 1504, 1691, 1756, 1784, 1796, 1852, 1900, 1902, 1959, 1998, 2038, 2138, 2228, 2265, 2276, 2284, 2316, 2332, 2358, 2380, 2407, 2458, 2460, 2464, 2465, 2483, 2537, 2544, 2623, 2624, 2625, 2683, 2702, 2708, 2747, 2804, 2809, 2810, 2827, 2828, 2837, 2863, 2880, 2907, 3424, 4069
	Artic Test Board, Fort Greely, Alaska	3895, 4550
	Aviation Board, Fort Rucker, Ala.	3706, 3806, 3875, 4441
	Ballistic Research Laboratories, Aberdeen Proving Grounds, Md.	3232, 3250, 3255, 3304, 3312, 4670, 4691
	Camp Evans Signal Laboratories, Belmar, N. J.	3077
	Diamond Fuze Laboratories, Washington, D. C.	4074, 4513, 4606, 4694, 4784, 4979
	Electrical Proving Ground, Fort Huachuca, Ariz.	3851, 3882, 3985, 4371, 4485, 4972, 4973, 4974

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2. MAXWELL, J. C., "A Dynamical Theory of the Electromagnetic Field," Trans. Roy. Soc. (London), p. 459; 1865. ABSTRACT: A classic reference on electromagnetic theory. (a-4, b-1, c-1, d-5, e-0, f-Theory)

3. MAXWELL, J. C., "Treatise on Electricity and Magnetism." vol. 1, Oxford University Press, London; 1873. ABSTRACT: A classic reference on electromagnetic theory. (a-4, b-1, c-1, d-5, e-0, f-Theory)

4. HERTZ, M., Electric Waves, (Book, English translation 1909); 1893. ABSTRACT: A classic reference on electromagnetic theory. (a-4, b-6, c-1, d-0, e-0, f-Theory)

5. MARCONI, G., "Wireless Telegraphy," JIEE, vol. 28, pp. 273-290; 1899. ABSTRACT: A classic reference on electromagnetic theory. Abstract in Science Abstracts, 1899, No. 1452, p. 650. (a-4, b-1, c-1, d-5, e-0, f-Theory and experiment)

1900 to 1902

6. KENNELLY, A. E., "On the Elevation of the Electrically-Conducting Strata of the Earth's Atmosphere," Electrical World, vol. 39, p. 473; 1902. ABSTRACT: A short note in which the author predicts the existence of an electrically conducting layer of rarefied air approximately 50 miles above the earth's surface. The prediction is based on simple calculations involving the conductivity of rarefied atmosphere and the height of the rarefaction. The author suggests that if such a layer exists, then propagation will bounce back and forth between this layer and the ocean, and progress around the earth. The field intensity will diminish with the first power of distance. (a-1, b-1, c-1, d-5, e-0, f-Theory and prediction)

1903

7. BRAUN, F., "Research on a Method of Directive Wireless," Phys. Zeit., vol. 4, pp. 361-364; 1 April 1903. ABSTRACT: The author first refers to a misunderstanding as to the length of the waves he has been working with. He points out that his statement that he was using longer waves than Marconi only referred to the latter's early experiments. Some experiments on directed receiver circuits are then described. In one of these, carried out with the aid of the Military Balloon Dept., the essential point was to manage with the least height of aerial. A straight receiver wire was laid with a slant of about 1 in 12 in the direction of the transmitter. The observations made showed that (1) with correct orientation it is possible to receive with small heights of aerial wire (5 m instead of 15 or 20 m), (2) the correct length of wire makes more difference than when using a vertical aerial (3) if one is already in the region within which signalling is certain, a shifting of the receiver ±10° out of the transmitter plane causes the signals to vanish. At greater distances, a rotation of 45° is requisite. Reference is then made to another kind of directed receiver devised by v. Sigsfeld. This resembles in principle the now well-known method of Stone, in which two aerials are rotated until a null effect is obtained. (a-4, b-1, c-4, d-4, e-0, f-Experimental results)

8. POINCARÉ, H., "The Diffraction of Electric Waves," Proc. Roy. Soc., vol. 72, pp. 42-52; 8 July 1903. ABSTRACT: The author raises objection to H. M. Macdonald's analysis. He doubts whether existing theory is capable of explaining the results obtained by Marconi in long-distance wireless telegraphy, and suggests the possibility that the waves may undergo successive reflection from the upper layers of the atmosphere, rendered sufficiently conducting by their high rarefaction. (a-3, b-1, c-1, d-5, e-0, f-Theory)

1904 to 1906

9. MARCONI, G., "On Methods Whereby the Radiation of Electric Waves May Be Mainly Confined to Certain Directions and Whereby the Receptivity of a Receiver May Be Restricted to Electric Waves Emanating from Certain Directions," Proc. Roy. Soc., vol. 77, pp. 413-421; 30 April 1906. See also Electrician, vol. 57, pp. 100-102; 4 May 1906. ABSTRACT: The author describes experiments made by using, in place of the usual vertical aerial, an insulated horizontal wire suspended a short distance from the ground and connected at one end to one ball of the spark gap, the other ball being earthed. The emission of radiations from such a wire is found to be a maximum in the vertical plane of the wire, and to proceed chiefly from the spark-gap end. It is reduced to practically nothing, or a minimum, in directions 100° from that of the maximum. As a receiver, a similar horizontal wire, connected at one end through a magnetic detector to earth, indicates a maximum of received current when the transmitter and receiver wires are in the same vertical plane and the earthed (through detector) end of the receiver wire is pointed towards the transmitter. The experiments were made with (1) horizontal transmitter and vertical receiver wire, (2) both wires horizontal, (3) vertical transmitter and horizontal receiver wire, using the magnetic detector for long, and the Duddell thermo-galvanometer for short distances (apparently up to 680 m). The results up to 500 km show that in the various tests, no detectable signals are received if the horizontal wire is much displaced out of the vertical plane common to both transmitter and receiver (35° displacement of receiver wire stopped signals at 500 km). Polar diagrams are given of the received current on the thermo-galvanometer in microamperes as the horizontal wire is rotated; these appear to show that rotation at the receiver produces more effect than rotation at the transmitter. Near Poldhu a radial system of eight horizontal wires, any one of which could be connected to a magnetic detector, was tried, signals being sent from H.M.S. Furious while steaming in a semicircle 16 miles off (vertical transmitter wire). The ship's bearing could be determined by noting with which wire the signals were strongest, and which were nonreceptive. The wavelength used should be over 150 m, and the best length for the horizontal wire is about $\lambda/5$ if suspended near the ground, or shorter if on the ground. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

10. PAPALEXI, N., AND MANDELSTAM, L., "A Method of Obtaining Oscillations in Different Phases," Phys. Zeit., vol. 7, pp. 303-306; 1 May 1906. ABSTRACT: The authors, at the suggestion of F. Braun, have devised a method by which two oscillatory currents of sine wave-form and in circuits practically independent of one another, may be started with a difference of phase. (a-3, b-1, c-4, d-4, e-0, f-Theory)

11. GALLIOT, F., Correspondence on "On Methods Whereby the Radiation of Electric Waves May Be Mainly Confined to Certain Directions and Whereby the Receptivity of a Receiver May Be Restricted to Electric Waves Emanating from Certain Directions," Electrician, vol. 57, p. 183; 18 May 1906. ABSTRACT: Galliot calls attention, in connection with Marconi's horizontal wire, to some experiments made by Garcia in 1900. (a-3, b-1, c-1, d-5, e-0, f-Theory)

12. ANONYMOUS, Editorial on "Directed Wireless Telegraphy," Electrician, vol. 57, p. 220; May 1906. ABSTRACT: An editorial providing some early history on the subject of directed wireless telegraphy. This editorial appears to be the one referred to by several authors in later papers of this early period, for instance, see Abstract No. 14. (a-4, b-1, c-1, d-5, e-0, f-Historical)

13. BRAUN, F., "On Directed Wireless Telegraphy," Electrician, vol. 57, pp. 222-224; 25 May 1906. See also pp. 244-248; 1 June 1906. ABSTRACT: The theory of the arrangement of transmitter aerials so as to produce a stronger action at a distance in one particular direction, is given, with particulars concerning the experiments. The phase differences were produced by means devised by Papalexi and Mandelstam, to be published later, and were measured by the method previously described by the author, bolometers of Tissot's type being used. The experiments comprised investigations (a) of the field in the case of a fixed phase difference, (b) on the influence produced on the field by an alteration in the phase difference. The results obtained show that the electromagnetic fields produced at a distant point by the arrangement of transmitter wires, can be calculated sufficiently accurately from the theory, and that the methods employed for producing the phase differences are reliable. For details, the original should be referred to. (a-3, b-1, c-1, d-5, e-0, f-Theory and experiments)

14. BROWN, S. G., "Directed Wireless Telegraphy," Electrician, vol. 57, pp. 251-252; 1 June 1906. ABSTRACT: Referring to an editorial commenting on Braun's paper, the writer points out that he described in 1899 a method of transmitting and receiving by means of two vertical aerials placed half a wavelength apart. Experiments were carried out with oscillating systems of gauze cylinders 15 ft high

placed half a wavelength from "mirrors" 20 ft high, up to 14 miles distance. (a-3, b-1, c-1, d-5, e-0, f-Experimental description)

15. FLEMING, J. A., "A Note on the Theory of Directive Antennae or Unsymmetrical Hertzian Oscillators," Electrician, vol. 57, pp. 455-457; 6 July 1906. See also Proc. Roy. Soc., Ser. A, vol. 78, pp. 1-8; 21 July 1906. ABSTRACT: The author shows that the horizontal aerial wire used by Marconi and others as a means of directing radiation, may be represented as a combination of three elementary Hertz oscillators. In order to obtain the lines of force at any moment, it is therefore, only necessary to superpose the fields due to the three oscillators. Equations for the scalar and vector potentials are obtained for the field at a distance from the oscillator. From these equations the author deduces E, the amplitude of the electric force perpendicular to the radius vector and to the equatorial plane, and H, the amplitude of the magnetic force perpendicular to the radius vector and in the equatorial plane. An examination of the maxima and minima of these expressions shows that the theory agrees with the experimental observations made by Marconi. (a-3, b-1, c-1, d-5, e-0, f-Theory)

16. FLEMING, J. A., "On the Electric Radiation from Bent Antennae," Phil. Mag., vol. 12, pp. 588-604; December 1906. See also Electrician, vol. 58, pp. 416-420; 28 December 1906; Ecl. Elect., vol. 50, pp. 141-143; 26 January 1906; Jahrb. d. Drahtl. vol. 1, p. 329; 1907. ABSTRACT: This paper is a description and discussion of some experiments on short bent antennae, made in the courtyard of University College, London, for the author by G. B. Dyke. The antennae used consisted of a couple of No. 16 bare copper wires loosely twisted together and from 10 to 20 ft in length. On the grass of the courtyard some large sheets of zinc were laid down to form earth-plates. At one of these posts used as a transmitting station, a bent radiating antenna was constructed by connecting one pair of spark-balls to the earth-plate and the other to a length of the copper wire which was so arranged that any fraction of its length could be placed vertical and the remainder horizontal. The free insulated farther end of the horizontal portion generally carried a plate of zinc 18 in. square, which served as an additional capacity. The wave detector was a fine constantan wire whose rise of temperature was observed by means of a tellurium-bismuth couple soldered to it, the whole being enclosed in a vacuum. The minimum rms current observable on this instrument was 300 microamperes. No attempt was made to tune the receiving antenna to the transmitting antenna with any great exactness. The experiment consisted in placing the bent transmitting antenna at a certain distance from the fixed vertical receiver antenna and then swivelling around the horizontal part into various directions and taking readings of the current in the receiving antenna in each case. In the first set of experiments, the sending antenna consisted of a double copper wire 20 ft in length, having at the free end a terminal capacity plate, the wire being bent over at various heights from the ground or earthed end, so as to make a bent antenna with 1 ft vertical and 19 horizontal or 2 ft vertical and 18 horizontal, and so on. Observations were taken with a receiving antenna at the same distance, but at various angular positions around the transmitter. The currents in the receiver were plotted as radii vectors of a polar curve, and these radii were therefore proportional to the electric and magnetic fields at equal distances around its center but in different azimuths. It can be seen from the curves given in the original that the greatest fore-and-aft inequality is obtained with this particular antenna bent so that 2 ft of it is vertical and 18 horizontal, and that at the distance chosen, viz. 138 ft, the field in the direction in which the free end points is then about 60 percent of that in the opposite direction. The minimum is found at about 105° from the maximum. Other forms of antenna were tried, some of which consisted of a vertical portion with a horizontal part attached at various heights. The author expands the theory of these actions, as explained in an earlier paper, and shows that experiment confirms the theory that the polar curve for an antenna with magnetic but no electric moment, viz. for a closed circuit, is a figure-of-8 shaped curve. The polar diagram for an antenna with electric but no magnetic moment, viz. for a vertical wire, is a circle. Experiments were also made with the outer part of the antenna extended at angles differing as much as 20° from the horizontal, which also confirmed the theoretical expectations. The similarly shaped polar curves given by Marconi for a bent receiving antenna are to be explained somewhat differently. They are due to the electric and magnetic force of the incident wave cutting, the vertical portion of the antenna with the added effect of the magnetic force lines passing under the horizontal part of the receiving antenna, being alternately reversed in direction, aided by the wavelength being roughly four times the length of that wire. The total emf is the vector sum of these three separate emf's. The numerical values of the first two are equal, and the third is proportional to the minimum radius of the polar curve in the direction 105° to 110°. (a-3, b-1, c-1, d-5, e-0, f-Theory and experiment)

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17. ULLER, K., "For the Explanation of the Method of Working of the Marconi Directive Transmitter," Phys. Zeit., vol. 8, pp. 193-195; 1 April 1907. ABSTRACT: The author disagrees with Fleming's statement that experimental results have so far confirmed the theory of the bent aerial. Marconi's and Fleming's experimental results may be accepted as correct. It is shown, that if the earth's surface acted like a metallic mirror, as assumed by Fleming in his theory, the result would be a maximum radiation in the direction of the concave side of the radiator which is opposite to that found by experiment. That Fleming has obtained the reverse result, theoretically, is due to an ambiguity in his formula; whereby no distinction is made between the motion of the radiator and the motion of a point in the field. His formula would be correct if instead of cos θ it were written - cos θ; but this, of course, would upset the agreement between theory and experimental results. The ground therefore, does not, even approximately, behave as a metallic mirror, and the explanation of the greater radiation from the convex side must be looked for in absorption of the lines of force on the concave side on account of their greater density, and of their direction, which is more nearly parallel to the ground. (a-3, b-1, c-1, d-4, e-0, f-Theory)

18. PICKARD, G. W., "An Ungrounded Closed Circuit for Receiving Wireless Signals," Elect. Rev. of N. Y., vol. 50, pp. 985-986; 15 June 1907. See also Electrician, vol. 59, pp. 563-564; 19 July 1907; Elect. Engineering, vol. 2 pp. 54-55; 11 July 1907. ABSTRACT: The author gives the results of experiments made with a closed circuit, including a condenser for tuning which is not earthed and is placed so as to make use of the magnetic component of the transmitted radiation (i.e., placed with the plane of the loop in the common vertical plane joining transmitter and receiver). Good signals were received from the South Wellfleet (Mass.) Marconi station, about 90 miles distant, the silicon detector of the author being used as detector. When adjusted for maxim m response, the intensity was found to be approximately 0.01 erg per dot. No alteration in the tuning or the intensity was observed when any part of the rectangle was earthed, so that no portion of the received energy apparently comes from the electric component of the transmitter radiation. The inductance of the rectangle was 0.106 millihenry, and, when in tune with Wellfleet, the condenser capacity was 9000 mmf, giving a frequency of 163,000, which is very approximately that of the Wellfleet station. A larger rectangle, of 0.187 millihenry, received 0.06 erg per dot from Wellfleet. The loop is found to have a marked directive property, the strength of signals becoming zero when the transmitter radiation comes from a direction at right angles to the plane of the loop; the null point is very sharply defined. It is suggested that such a loop could be used as a direction finder by making the loop rotatable and finding the null point. (a-3, b-1, c-1, d-1, e-0, f-Experimental)

19. DE FOREST, L., Correspondence on "An Undergrounded Closed Circuit for Receiving Wireless Signals," Electrician, vol. 59, p. 807; 30 August 1907. ABSTRACT: Referring to Pickard's use of a nonearthed closed loop, the writer claims that he has previously described such a receiving circuit in U. S. Pat. 771,819, and also, the horizontal receiving antenna described by Marconi. (a-3, b-1, c-1, d-5, e-0, f-Review of Abstract No. 18)

20. ZENNECK, J., "On the Propagation of Waves along a Conducting Surface," Ann. d. Physik, vol. 23, pp. 846-866; September 1907. ABSTRACT: The author has provided equations for the forward tilt of the vertically polarized wavefront as a function of wavelength for a specific resistance and dielectric constant of the soil. The tilt is expressed as the ratio of the forward horizontal to the vertical potential gradient of the space wave. In Zenneck's formula, the test ratio is a vector quantity with the phase angle ranging from zero to 45 degrees. Under the most common conditions, that is, where the earth carries the current by conduction rather than by capacity, the phase angle is nearly 45 degrees. The phase difference means that the vertical and horizontal potential gradients are not zero simultaneously. Under these circumstances, if a linear conductor is held in various positions in a vertical plane parallel to the direction of wave propagation, there will be no direction of the conductor for which the electromotive force induced is zero. (a-4, b-1, c-4, d-4, e-0, f-Theory)

21. BELLINI, E., AND TOSI, A., "A Directive System of Wireless Telegraphy," Elect. Engineering, vol. 2, pp. 771-775; 14 November 1907. See also Electrical World, vol. 50, pp. 1203-1206; 21 December 1907. ABSTRACT: The authors give a description of a new system of wireless telegraphy employing nearly closed, nonearthed aerial circuits at both transmitter and receiver, and give the results of experiments carried out between three full-size stations, at

Dieppe, Havre, and Barfleur respectively. The aerial structure at these stations consists of a triangular circuit supported from the apex by a single mast; the whole forms a complete circuit except at the apex, where the two ends of the circuit are open (insulated). The energy radiation from such a circuit, when used as transmitter, is found to be a maximum in the plane of the circuit, and zero at right angles to this direction. Polar diagrams of the received energy are given. When such a circuit is used for reception, the intensity is a maximum in the plane of the circuit and zero at right angles. Owing to this directive property, it has been possible for the authors to devise an arrangement by which not only can the radiated energy be given a maximum in any desired direction, but the reception can also be caused to take place in one desired direction; or conversely, if the direction of the received radiation be not known, this direction can be determined. The means employed to effect this consisted in the use of two such nearly closed aerial circuits at right angles to one another, the two circuits being connected up to a special form of jigger. In figures shown (crossed loops with search coil - Ed.) A, B represents in plan, the base of one triangle circuit, A_1, B_1 that of the circuit at 90° to the first, m_1 and n_1 being the secondary windings of the jigger, connected in their respective aerial circuits; s_1 is the primary of the jigger, and is movable about a central axis. It is obvious that in the position shown each secondary will be influenced to an equal degree by the primary current, and hence the radiation from the two aerial circuits will be equal, giving a maximum emission in a direction midway between m_1 and n_1, i.e., in the plane of the primary coil; hence, by means of a pointer mounted on the primary, the radiation can be given any desired direction corresponding to that of the pointer. A similar arrangement is used for the reception, but, in this case, the movable coil s is made the secondary. Thus, if the direction of the oncoming radiation is known, the pointer of s may be set to this, and the message received to the exclusion of others off this line of direction; or if unknown, the radiant point can be rapidly determined by turning the pointer until the reception is a maximum. Diagrams are given of the different arrangements used for transmission and reception with direct and inductive excitation. The early results have shown that with considerably less that 500 watts of primary energy, good communication could be maintained between Dieppe and Havre (55 miles overland), and Dieppe and Barfleur (110 miles oversea). The angle between the stations Dieppe-Havre-Barfleur is 23°, but the Dieppe-Barfleur transmission did not affect Havre, nor did the Dieppe-Havre transmission affect Barfleur. The height of aerial is 48 m (wires of 60 m at 60°, 60 m base). A further advantage, it is pointed out, lies in the fact that the system is practically free from atmospheric disturbances, except those which are in the direct line of transmission. The benefits which ordinary systems derive from accurate tuning are, of course, obtainable in addition to the above special characteristics. (a-3, b-1, c-1, d-1, e-0, f-Theorectical and experimental description of the original crossed loops)

22. ANONYMOUS, Editorial on "A Directive System of Wireless Telegraphy," Elect. Engineering, vol. 2, p. 748; November 1907. ABSTRACT: An editorial which refers to the Bellini-Tosi article of 14 November 1907 described in the previous Abstract No. 21. (a-3, b-1, c-1, d-1, e-0, f-Editorial)

23. WALTER, L. H., Reply to editorial on "A Directive System of Wireless Telegraphy," Elect. Engineering, vol. 2, p. 864; 28 November 1907. ABSTRACT: Refers to an editorial note in which the system was referred to as a development of the Artom system, and points out that the shape of the closed circuit is only triangular in this case for convenience; it can be of any shape. No circularly polarized emission is possible, because the currents in the two circuits at 90° are either in phase or 180° apart. Experiments have proved that the propagation of circularly polarized radiation, as described by Artom, does not take place. (a-3, b-1, c-1, d-1, e-0, f-Theory)

24. BRAUN, F., "Directive Wireless Telegraphy," Jahrb. d. Drahtl. vol. 1, p. 1; 1907. ABSTRACT: Concerns measurements of directional properties of straight inclined conductors. (a-4, b-1, c-4, d-4, e-0, f-Experimental)

25. MANDELSTAM, L., "The Theory of the Bent Antenna," Jahrb. d. Drahtl, vol. 1, p. 333; 1907. ABSTRACT: Concerns measurements of directional properties of straight inclined conductors. (a-4, b-1, c-4, d-4, e-0, f-Experimental)

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26. BELLINI, E., AND TOSI, A., "Experiments on a Directive System of Wireless Telegraphy," Electrician, vol. 61, p. 461; 1908. ABSTRACT: Not available, see Abstract No. 21. (a-4, b-1, c-1, d-5, e-0, f-Not available)

27. BRAUN, F., Correspondence on "Experiments on a Directive System of Wireless Telegraphy," Electrician, vol. 61, p. 571; 1908. ABSTRACT: Correspondence relative to the Bellini-Tosi system of Abstract No. 21. (a-4, b-1, c-1, d-5, e-0, f-Theory)

28. TOSI, A., Correspondence on "Experiments on a Directive System of Wireless Telegraphy," Electrician, vol. 61, p. 692; 1908. ABSTRACT: Correspondence relative to the Bellini-Tosi system of Abstract No. 21. (a-4, b-1, c-1, d-5, e-0, f-Experimental description)

29. MANDELSTAM, L., "Directive Wireless Telegraphy," Jahrb. d. Drahtl, vol. 1, pp. 291-306; January 1908. ABSTRACT: The author deals separately with the means employed by Braun and by Marconi and the theoretical explanation of the latter's results given by Fleming. He then deals with Artom's "method," and concludes that Artom's own explanation of the transmission does not describe what actually takes place. (a-4, b-1, c-4, d-4, e-0, f-Theory)

30. ZENNECK, J., "Action of the Receiver in Directive Wireless Telegraphy," Phys. Zeit., vol. 9, pp. 50-53; 15 January 1908. ABSTRACT: The author discusses the theory of the horizontal or sloping aerial of the receiving station in directive wireless telegraphy. After mentioning Marconi's experiments which led to the adoption of aerials of this type at his Transatlantic stations, he proceeds to a mathematical explanation based on the following data: (a) at great distances from the transmitter, the electrical field of the transmitted waves is, in general, an alternating field more or less inclined to the vertical and having a rotating component, i.e., there is always an appreciable horizontal component in addition to the vertical one; these components usually differ in phase by some angle less than 45°; (b) the receiving aerial is supposed to be tuned to the transmitted current frequency; (c) the amplitude of the induced currents in a linear resonator may be expressed as

$$\phi = \int F(l) \cdot \frac{\partial E_l}{\partial t} \cdot dl$$

where dl is an element of the resonator, E_l the component of the field E along the resonator at the element, and the function $F(l)$ is such that $i_0 = I_0 F(l)$ where i_0 is current at l and I_0 the current at the current loop. Two integrals of this type define the conditions in the vertical and horizontal parts of the aerial respectively. If the horizontal part is turned away from the transmitting station, the amplitude in the whole aerial is their sum, and if toward the transmitting station, their difference. Thus, since the electric field is never quite vertical, an aerial of this form will give in the first position better results than a vertical one of the same height. The same is shown to be true whether the vertical and horizontal components are in phase or not. The effect and distribution of the earth currents near the wire is next considered and the advantage of a conducting network spread from the lower end of the aerial in the direction of the sending station (Fessenden's wavechute) is mathematically explained. It is pointed out that the conclusions apply to sloping aerials such as Braun has used. Finally, it should be noticed that directive aerials are only of value in cases where there is a horizontal component in the electric field. This is always the case on land, but on board ship a directive aerial for receiving would be of small use; and it is also likely that the large mass of metal composing the ship's hull may tend to alter the form of the field to a considerable extent. (a-3, b-1, c-4, d-4, e-0, f-Theory)

31. PICKARD, G. W., Correspondence on "An Undergrounded Closed Circuit for Receiving Wireless Signals," Elect. Rev., N. Y., vol. 52, p. 262; 15 February 1908. ABSTRACT: The arrangement employed and the author's theory of action. (a-3, b-1, c-1, d-1, e-0, f-Theory)

32. BELLINI, E., AND TOSI, A., "A Directive System of Wireless Telegraphy," Elect. Engineering, vol. 3, pp. 348-351; 5 March 1908. ABSTRACT: The authors give the theory of the special form of jigger, now called a radiogoniometer, already described both for the reception and for the transmission, and also a photograph of the complete receiving radiogoniometer showing how tuning is simultaneously carried out in both circuits with a single setting. It is pointed out that since the middle point of the closed aerial circuit is a node of potential, this point can be earthed without altering the tuning; by this means the arrangement can be used (1) earthed, as an ordinary equiradial transmission and reception, or (2) nonearthed, as a directive

system, the change from one to the other method being made instantaneously by means of a single switch-arm. The receiving radiogoniometer can also, it is shown, be made to serve as a means of comparing the strengths of two or more transmissions. Thus, supposing that the detector employed is one which responds solely to the amplitude of the oscillations; for each transmission the two limiting angles on the radiogoniometer are determined for which the reception ceases. Calling α and β the angles for the one transmission, and γ and δ the angles for the other, the ratio of the amplitudes of the transmissions will be

$$\sin\frac{\alpha+\beta}{2}\Big/\sin\frac{\gamma+\delta}{2}$$

If the detector is of a type which responds to the total energy received, the preceding ratio is that of the energies emitted by two different transmissions. This enables one, further to determine the diagram of the field produced by a directive transmitter station at long distances. The same means enables one also to determine whether a detector responds to the maximum amplitude or to the energy of the electromagnetic field. For this, a directive transmitter station must be available whose diagram of emitted energy has been determined by means of a thermogalvanometer or similar instrument. If the detector under consideration, when used at a receiver station, gives a diagram similar to that obtained by the thermogalvanometer, this means that the detector responds to the energy. If, on the other hand, it gives a diagram whose radii vectors are proportional to the square roots of thermal detector's diagram, the detector responds to the amplitude of the field. If it gives an intermediate diagram, this may be taken as indicating that its operation is not clearly defined, and that it depends partly on the energy and partly on the maximum amplitude. (a-3 and 4, b-1, c-1, d-1, e-0, f-Part II of the paper described in Abstract No. 21)

33. KIEBITZ, F., "Directive Wireless Telegraphy," Elect. Engineering, vol. 5, pp. 233-234; 11 March 1909. See also Verh. d. Deuts. Ges., vol 10, pp. 934-944; 15 December 1908; Electrician, vol. 62, pp. 972-974; 2 April 1909. ABSTRACT: The author describes experiments with a directive arrangement somewhat similar to Bellini and Tosi's but consisting of two crossed systems each composed of two sloping vertical antennae, 8 m long, spaced a short distance apart and excited so as to vibrate in one-half wavelength (180° dephased). Later experiments with a single directive aerial arrangement were for the purpose of comparing the maximum range obtainable, with the same primary energy, (1) of an ordinary vertical antenna system, and (2) of the directive aerial. The range was determined with a portable station which could be moved progressively farther and farther away from the transmitting station. With 25 watts primary energy, signals from the vertical antenna transmitter could always be heard at 3600 m distance; beyond this they became weaker, and vanished at 3900 - 4000 m. At 4100 m the signals could in no case be heard. The directive aerial was first arranged with the antennae having their tips 18 m apart and then had a range of only little over 2000 m, but on increasing the distance apart of the tops of the aerials the range, measured in the same direction as that of the ordinary vertical antenna system, was quite equal to that of the vertical antenna station; in fact, signals from the directive aerial were received beyond the 4100 m limit. The results obtained with the portable station are plotted in a diagram which shows how very marked the region of zero radiation is (at right angles to the direction of maximum radiation), a point of silence being reached at only 200 m from the transmitter. (a-3, b-1, c-1, d-1, e-0, f-Theory and experiment)

34. BELLINI, E., AND TOSI, A., "A Directive System of Wireless Telegraphy," Elect. Engineering, vol. 3, p. 918; 18 June 1908. See also Phil. Mag., vol 16, pp. 638-657; October 1908; Proc. Phys. Soc., vol. 21, p. 305; 1908; Electrician, vol. 62, pp. 531-533; 15 January 1909. ABSTRACT: Finding that the radiation in the two halves of the symmetrical diagram in the bilateral system previously described was opposite in sign, the authors have been able to devise an arrangement which permits of the emission being confined to practically a single direction only, the backwardly directed radiation being completely cut off. The method employed consists in superposing the radiation from a directive bilateral aerial system, upon the radiation from an ordinary vertical antenna. When things are so disposed that the amplitude of the emission from one-half of the directive aerial is equal to and in phase with the emission from the vertical antenna, the resultant emission in the plane of the directive aerial will be double that of the component fields in the one sense and zero in the other sense. The diagram of the electromagnetic field should be a cardioid. Experimental results are shown. The actual arrangement of the transmitting radiogoniometer is such that the movable primary of the oscillatory circuit has placed inside it the secondary winding of the vertical antenna circuit, which hence is fixed in position relative to the primary; and, on rotating the primary, it is only the secondary windings of the directive aerials which are variably excited according to the angular position of the primary. (For photographs of the actual instruments see Soc. Inst. Elect., Bull. 8, pp. 707-730; December 1908.) At the receiving end it has been found possible to apply the same method of combining the directive aerial with a vertical antenna. In this case quadrature between the actions of the two systems has to be obtained, and several ways of effecting this are shown. With this unilateral reception it is possible to determine as to which side the transmission is coming from; on the bilateral method only the plane could be distinguished and not the sense. A maximum of reception is obtained with the radiogoniometer pointing in the direction of the transmitter, and a minimum or zero in the same plane, but in the other sense, i. e., at 180° to the first position. (a-3, b-1, c-1, d-1, e-0, f-Theory and experiment)

35. ZENNECK, J., "Action of the Transmitter in Directive Wireless Telegraphy," Phys. Zeit., vol. 9, pp. 553-556; 1 September 1908. See also Jahrb. d. Drahtl. vol 2, p. 1; 1908. ABSTRACT: The action of the horizontal aerial as a directive transmitter cannot be explained on the supposition of perfect conductivity of the earth, since at points on the earth's surface at great distances, such as occur in wireless telegraphy, the effect of the horizontal portion vanishes, leaving only that of the vertical section, and this is symmetrical all around. But since a horizontal aerial does act directively, it is clear that the resistance of the earth plays an important part in the transmission. The author has already shown that a consequence of the resistance of the earth's surface is that the electric lines of force are no longer vertical but slope forwards in the direction of propagation. Hence, as the transmission of energy is at right angles to these, the actual course of the radiation of energy is not horizontal but sloping downwards at the place where it reaches the ground. The ray of energy radiation reaching any given point must therefore travel from sender to receiver in a kind of arch, i. e., the energy received was not radiated horizontally but upwards at some angle to the earth's surface. Thus the horizontal portion of the transmitting aerial comes into play, since for directions of radiation out of the horizontal plane its component does not vanish at great distances. As the energy reaching any given point has thus travelled from the transmitter in a curve, the highest point of which is far above the earth's surface, it is clear that the conductivity of the upper layers of the atmosphere must greatly influence its amount. (a-3, b-1 c-4, d-4, e-0, f-Theory)

36. PICKARD, G. W., "Determination of Wireless Wave Fronts," Elect. Rev., N. Y., vol. 53, pp. 494-495; 3 October 1908. ABSTRACT: The author used a small circular loop of three turns, 1 m in diameter, connected up with a "perikon" (i.e., fused zinc oxide-metal point) detector and telephone, shunted by a variable condenser, to determine the azimuth at which the signals that are received from a transmitting station when the loop is oriented in the direction of said station disappear: this azimuth is taken as making an angle of 90° with the direction of transmission, and hence, corresponds to the direction of the wave front. A map of the town of Amesbury, Mass., with the wave fronts plotted, obtained in this way shows the marked effect of obstacles. A tree, for instance, was found to make a perceptible indentation in the wave front, while a 40-ft steel windmill tower, 1500 m from the transmitter, caused a most marked distortion. The wavelength employed was 501 m, and the power taken 500 watts. (a-3, b-1, c-1, d-1, e-0, f-Experimental study)

37. ARTOM, A., "The Artom System of Radiotelegraphy," Elec. Rev., 28 November 1908. ABSTRACT: A brief description of the Artom system, as taken from a paper by Professor Alessandro Artom read before the Itialian Electrical Association. No. 620. (a-3, b-2, c-1, d-5, e-0, f-Description)

38. TOSI, A., "Directive Wireless Telegraphy and Telephony," Soc. Internat. des Elect., vol. 8, pp. 707-730; December 1908. See also ETZ, vol. 30, p. 491; 1908. ABSTRACT: Describes the Bellini-Tosi apparatus including photographs of the instruments. (a-4, b-1, c-8, d-0, e-0, f-Experimental description)

39. BLONDEL, A., "Determining the Direction of Ships by Means of Hertzian Waves," Jahrb. d. Drahtl., vol. 2, pp. 190-199; December 1908. ABSTRACT: A system consisting of a pair of crossed triangular antennas is used with tapped coils. The system is very similar to that of Bellini and Tosi, but must be calibrated instead of having the direction of arrival of the wave indicated by the position of the null. Directions can be determined within 10 - 15 degrees. (a-1, b-1, c-4, d-4, e-0, f-Theory)

40. BLONDEL, A., Correspondence on "On the Determination of the Direction of Ships by Means of Hertzian Waves," Jahrb. d. Drahtl., vol. 2, p. 434; 1908. ABSTRACT: Correspondence concerning Abstract No. 39. (a-4, b-1, c-4, d-4, e-0, f-0)

41. BELLINI, E., AND TOSI, A., Correspondence on "On the Determination of the Direction of Ships by Means of Hertzian Waves," Jahrb. d. Drahtl., vol. 2, p. 434; 1908. ABSTRACT: Correspondence on Abstract No. 39. (a-4, b-1, c-4, d-4, e-0, f-0)

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42. BELLINI, E., "The Fundamental Principles of the Bellini-Tosi System for Directive Radio Telegraphy and Telephony," Jahrb. d. Drahtl., vol. 2, p. 608; 1909. ABSTRACT: Not available, see Abstract No. 21. (a-4, b-1, c-4, d-4, e-0, f-Theory)

43. BELLINI, E., "Energy Diagrams in Directive Wireless Telegraphy," Jahrb. d. Draht, vol. 2, no. 4, pp. 381-396; 1909. ABSTRACT: A theoretical investigation into the form assumed by the electromagnetic field and energy diagram under different conditions at the directive aerial. (a-3, b-1, c-4, d-4, e-0, f-Theory)

44. BELLINI, E., AND TOSI, A., "The Radio Direction Finder of Bellini and Tosi," Jahrb. d. Drahtl., vol. 2, p. 511; 1909. ABSTRACT: Not available, see Abstract No. 21. (a-4, b-1, c-4, d-4, e-0, f-Theory)

45. BELLINI, E., Practical notes on "The Radio Direction Finder of Bellini and Tosi," Jahrb. d. Drahtl., vol. 2, p. 239; 1909. ABSTRACT: Not available, see Abstract No. 21. (a-4, b-1, c-4, d-4, e-0, f-0)

46. BELLINI, E., AND TOSI, A., "The Radio Direction Finder," Atti dell' Assoc. Elettr. Ital., vol. 13, pp. 5-16; January-February 1909. ABSTRACT: The authors here give, as a reply to some remarks by P. Barreca on their previous paper, the results of an experimental and theoretical investigation, from which it is concluded that Barreca's criticism has no basis in theory or practice. The following points are established: (1) the currents in the transmitting aerials follow rigorously the sine law; (2) the polar diagrams of these are composed of two pairs of tangent circumferences; (3) the direction of the pointer of the radiogoniometer is always rigorously that of the most favourable propagation; (4) further, the emf induced in the movable coil of the receiving radiogoniometer varies rigorously according to the sine law; (5) the direction of maximum intensity indicated by the index of the receiving radiogoniometer is always and rigorously that of the transmitting station. (a-3, b-1, c-9, d-9, e-0, f-Theory)

47. ARTOM, A., "The Composition of Electromagnetic Fields and Waves," Elettricita, 11 February 1909. ABSTRACT: A discussion of the author's system of wireless telegraphy, with illustrations. No. 3349D. (a-3, b-2, c-9, d-9, e-0, f-Discussion)

48. BELLINI, E., AND TOSI, A., "Range and Advantages of Directive Aerials and the Bellini-Tosi Radiogoniometer," Lum. Elect., vol. 5, pp. 263-268; 27 February 1909. ABSTRACT: Discusses the radiation field of two vertical spaced antennas, and compares the results using this type of antenna to those using a triangular loop. A proof that the coefficient of coupling remains constant, as the angular position of the moveable coil of the radiogoniometer is changed, is included. (a-6, b-1, c-3, d-3, e-0, f-Theory)

49. BELLINI, E., AND TOSI, A., "A Directive System of Wireless Telegraphy," Phys. Soc. Proc., vol. 21, pp. 305-326; discussion pp. 326-328; March 1909. ABSTRACT: The authors' paper was dealt with in Abstract No. 34. In the discussion, J. A. Fleming said that the authors' experiments confirmed in many ways his theory of the bent antenna. W. H. Eccles considered that, apart from the fact that it is rarely feasible to fix up a large number of antennas, the radiogoniometer method had the advantage that the direction of transmission or reception can be altered perfectly smoothly. On the authors' showing, the radiogoniometer is the practical equivalent of 360 bent antennae. He criticized the looped aerials used as not being the best kind of radiator. He further pointed out that the looped antenna emits two waves of equal period, of phases differing 90° and 180° respectively, from the phase of the radiation from either side of the loop, and of amplitudes having a ratio proportional to λ/x. This means that one portion of the resultant radiation follows an inverse square law and the other portion an inverse cube law; the latter portion is the more important in the near field, the former is the more important when the distance is much greater than the wavelength λ. This explains why Fleming's experiments with closed oscillators gave small promise of powerful propagation to a distance and why the authors had found as a fact that good propagation occurred to great distances. (a-3, b-1, c-1, d-5, e-0, f-Theory)

50. SOMMERFELD, A., "The Propagation of Waves in Wireless Telegraphy," Ann. d. Physik, vol. 28, pp. 665-736; 16 March 1909. ABSTRACT: The author investigates the question as to whether the waves in wireless telegraphy are space waves or surface waves, i.e., free Hertzian waves in air or conducted waves. He points out that in the surface waves considered, the energy is mainly in the air; only a small proportion being in the ground or sea. In the case of free waves, the electromagnetic field is obtainable by simple differentiation from Hertz's equation $\pi = \frac{e^{ikR}}{R}$, where R is the distance from the "Dipol," and k a material constant of the medium. For conducted waves if ϵ, μ, σ be dielectric constant, permeability, and conductivity of the first or second medium (i.e., air or earth), we have, from the work of Uller and Zenneck

$$k = (\Sigma\mu n^2 + i\mu\sigma n)/c^2$$

If this function for air be denoted by k_1^2 and for earth by k_2^2, and if permeability be assumed unity we have $s = [k_1^2 k_2^2/(k_1^2 + k_2^2)]^{1/2}$, the real and imaginary parts of which determine the propagation and damping. The author introduces a definition of the quantity he terms the "numerical distance." This is not the absolute distance, but is rather a pure number, depending not only on distance but also on the constants of both media. This is

$$\rho = \left| \frac{k_1^4}{k_2^4} \cdot \frac{k_1^2 - k_2^2}{k_1^2} \cdot \frac{k_1 r}{2} \right| .$$

In the particular case where k_1 is real, i.e., for undamped waves in the air, k_2^2 is purely imaginary, and k_1^2 small as compared with $|k_2^2|$, this equation may be written $\rho = k_1^2 k_1 r/(-ik_2^2)2$. The numerical distance ρ increases with absolute distance r, but for equal values of the latter is much greater over sea than land. It is pointed out that the manner of earthing, whether conductive or by a capacity, has no appreciable influence on the subsequent node of propagations, and does not determine the type. Supposing that the actual distance is 1/4 of an earth quadrant, i.e., about the distance between the Marconi Transatlantic stations, we have as values of the "numerical distance" for a wavelength of 2000 metres

Sea Water	Fresh Water	Wet Ground	Dry Ground
$\rho = 1/30$	$\rho = 30$	$\rho = 65$	$\rho = 300$

Increase in wavelength decreases numerical distance both in theory and practice. It is found that the assumption that sea water is equivalent to a perfect conductor is only valid for a very small range of distances, only as far as 240 km over sea for waves of 2 km, or 8 km for waves of 360 m. A very thorough mathematical analysis of the problem shows that surface, or conducted, waves exist, and that in addition there are space waves of a peculiar type in each medium. The amplitude of the conducted waves varies as $1/\sqrt{r}$, where r is the actual distance, that of the space waves as $1/r^2$. Hence we see that beyond very moderate distances, the conducted waves entirely overpower the space waves. It should be noted that the space waves here dealt with are by no means identical with free waves in a homogeneous medium, but are of a type altered by the relations between the two media and by the coexistence of the conducted waves. The curvature of the earth favours the propagation of the conducted waves so much that it is probable that even where space waves are indicated by the mathematical analysis as existing at considerable distances they are quite negligible in comparison. (a-3, b-1, c-4, d-4, e-0, f-Theory, see later papers on surface waves for further comment on this paper.)

51. MACDONALD, H. M., "Note on Horizontal Receivers and Transmitters in Wireless Telegraphy," Electrician; 4 June 1909. ABSTRACT: Read before the Royal Society; considers the theory of such an arrangement. No. 5519A. (a-3, b-1, c-1, d-5, e-0, f-Theory)

52. ANONYMOUS, "Bellini-Tosi System," Sci. Am. Sup.; 12 June 1909. ABSTRACT: Illustrates and describes a method of directing Hertzian waves. No. 5405. (a-3, b-2, c-1, d-1, e-0, f-Description)

53. PICKARD, G. W., "Antennae," Electrician, vol. 63, pp. 587-589; 23 July 1909. ABSTRACT: An elementary resumé of the known facts as regards the shape and properties of antennae, which, however, omits all reference to recent results of other workers. (a-3, b-1, c-1, d-5, e-0, f-Resumé)

54. ANONYMOUS, "Wireless Telegraphy in the U. S. Navy," Elec. Wld.; 30 September 1909. ABSTRACT: Information in regard to the equipment of the navy vessels. No. 8247. (a-3, b-2, c-1, d-1, e-0, f-Description)

55. DE COURCY, A., "The Bellini-Tosi Directional Wireless System; The New Experiments," Elec. Rev.; 30 October 1909. ABSTRACT: Illustrated description of the work of these Italian scientists in the directing of wireless messages. No. 9019. (a-3, b-2, c-1, d-1, e-0, f-Description)

56. WALTER, L. H., "Constancy of Coupling in the Bellini-Tosi Radiogoniometer," Electrician, vol. 64, p. 262; 26 November 1909. ABSTRACT: Calls attention to Bellini's proof that the coupling is constant for all positions of the movable coil and explains the phase relations between the currents in the circular and directive aerials in the "unilateral" system. (a-6, b-1, c-1, d-5, e-0, f-Theory)

57. MARCONI, G., "Wireless Telegraphy," Elec. Engr.; 17 December 1909. ABSTRACT: The Nobel Prize lecture. Outlines the history of the writer's work in the field of radiotelegraphy, calling attention to some observations still needing explanation. No. 10408. (a-3, b-1, c-1, d-5, e-0, f-Survey)

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58. FLEMING, J. A., The Principles of Electric Wave Telegraphy and Telephony, Longmans & Co.; 1910. ABSTRACT: Not available. (a-4, b-6, c-1, d-0, e-0, f-0)

59. TOSI, A., "The Boulogne Radio Station," Soc. Internat. des Elect., vol. 10, p. 147; 1910. ABSTRACT: Description of apparatus. (a-4, b-1, c-8, d-0, e-0, f-Description)

60. BELLINI, E., "The Constancy of Coupling in the Bellini-Tosi Radio Direction Finders," Jahrb. d. Drahtl., vol. 3, pp. 571-580; 1910. ABSTRACT: A more complete theoretical investigation by a new method of the question already dealt with in Abstract Nos. 46 and 56. It is also shown by experiment, that the theoretical requirements are realized in the actual apparatus, the currents in the two aerial systems being measured for different positions of the movable coil of the transmitting radiogoniometer. In the case of the receiving radiogoniometer, a direct proof was obtained by sending a low frequency (25 cycle) current through one of the fixed coils, and measuring the current in the movable coil by means of a hot-wire ammeter for various orientations of the latter coil. Here again, complete agreement is obtained between the theoretical and empirical values. The lengths of the two waves in the receiver are therefore quite independent of the angular position of the movable coil. (a-3, b-1, c-4, d-4, e-0, f-Theory and experiment)

61. WALTER, L. H., "Radiation from Directive Aerials," Electrician, vol. 64, pp. 790-792; 25 February 1910 (Corrigenda, p. 875), p. 899; 11 March 1910, and pp. 946-947; 18 March 1910. ABSTRACT NO. 1: The author gives polar diagrams of electromagnetic field intensity, plotted from a consideration of the known form of diagram obtained from a directive aerial under given conditions, to show that the proposal of Artom to change the directive of maximum emission by changing the phase-difference in the two parts of the aerial system, is ineffective from the practical point of view owing to the limited and irregular movement of the maximum. ABSTRACT NO. 2: Deals with the question of dirigibility in the emission of electric waves, taking into account the methods of Artom, and of Bellini and Tosi. (a_1-3, a_2-3, b-1, c-1, d-5, e-0, f-Theory)

62. ECCLES, W. H., AND ARTOM, A., Reference to "Radiation from Directive Aerials," Electrician, vol. 64, p. 834; 4 March: p. 899; 11 March 1910. ABSTRACT: A criticism and remarks on Abstract No. 61. (a-3, b-1, c-1, d-5, e-0, f-Reply)

63. WALTER, L. H., Reference to "Radiation from Directive Aerials," Electrician, vol. 64, p. 947; 18 March 1910. ABSTRACT: A reply to Abstract No. 62. (a-3, b-1, c-1, d-5, e-0, f-Author's reply)

64. VAN MIERLO, S., "Wireless Telegraphy," Bull. Sci. d l'Assn d Eleves; April 1910. ABSTRACT: A general review of theory, practice, apparatus, systems, etc., with statistics of established stations. (a-3, b-1, c-3, d-3, e-0, f-Review)

65. KIEBITZ, F., "Wireless Telegraphy Experiments with Antennae of Various Shapes," Ann. d. Physik, vol. 32, no. 5, pp. 941-978; 8 July 1910. ABSTRACT: The author gives a detailed account of experiments which were made to settle some debatable points. First, a number of vertical antennae of different shapes were tried, (1) with insulated counterweights; (2) with earth connection. Next, multiple vertical antennae were used, and then horizontal ones, including the arrangement of a double pair of antennae as used by Bellini and Tosi. Finally some tests were made to see if it was not possible to transmit and receive signals without any aerials, and using only earth connections. At the transmitter a helix, coupled to the transmitter primary, had its ends connected to the inner coatings of two Leyden jars of 340 cm capacity and about 22 m apart, by means of insulated leads; the outers were connected respectively to buried zinc plates. The whole system was tuned to 204 m wavelength and the leads connecting the helix to the jars were covered over with earth. With this arrangement good signals were received by the portable receiving station at 1-1/2 km distance in the line of the jars. Sideways, the receiver could approach within 20 m of the transmitter without getting signals. A similar arrangement was employed for receiving, to try and pick up the signals from Nauen, 45 km distant. The distance between the jars was made 60 m, and a variable condenser was used to shunt the helix, enabling tuning to 2000 m wavelength to be effected. The Nauen signals were received in this way even without the earth connections, it sufficing to hold the Leyden jars in the hand. Another receiving arrangement comprised a 340-cm capacity jar, buried in the ground, the outer coating connected to a wire netting of 15 sq m area laid on the wet ground. The inner coating was connected, through a partly buried insulated wire, to a helix placed 200 m away from the jar and in the direction away from Norddeich. Tuned to 2000 m and using an aperiodic detector circuit, the Norddeich signals were quite loudly received. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

66. KIEBITZ, F., "New Trials with Directive Wireless Telegraphy with Earth Antennae," Verh. d. Deuts. Ges., vol. 13, p. 870; 1910. ABSTRACT: See Abstract No. 57. (a-4, b-1, c-4, d-4, e-0, f-Experiments)

67. WALTER, L. H., "Directive Wireless Telegraph Station at Boulogne," Electrical Engineering, vol. 6, pp. 457-459; 14 July 1910. ABSTRACT: The author gives a complete description of the equipment, and includes some results of quantitative experiments made with the Bellini-Tosi directive method. The aerials are supported by a series of four iron towers, 46 m in height, spaced at the corners of a square of 80 m side. Each directive aerial comprises two inclined harps of wire, joined at the base by a wire leading to the instrument-room, which is at the centre. There are two such aerial systems, placed at right angles to one another. The antenna for the ordinary (earthed) system consists of a roof aerial in the shape of a horizontal cross, extending between the tops of the towers. The change over from the ordinary to the directive method is effected by moving a single switch-handle. The natural wavelength of the directive aerials was about 600 m, but as it was desired to work with a 300-m wave the frequency was lowered by a special arrangement until the wavelength was 900 m; and signalling is effected by working on the harmonic (triple frequency). Regular communication has been established (by night) with Algiers (1500 km), using only about 500 watts of primary energy. Some quantitative measurements have been carried out by Bellini and Tosi which serve to confirm their theoretical prediction that the directive system should, for equal primary energy, have a greater range than the ordinary system. A Duddell thermo-galvanometer, set up at the Column de la Grand Armée, 3 km distant from the station (10 wavelengths away), was used to obtain diagrams of the energy radiated in different directions by the directive aerial, and for making a comparison of the energy radiated by this system with that emitted by the ordinary vertical antenna. Using a single harp of one directive aerial as an ordinary antenna, connected to earth through the radiogoniometer, the mean deflection obtained as 35 mm, with a current of K × 0.24 amp in the antenna. With the complete directive aerial, not earthed, the mean deflection obtained was 113 mm, the current in the aerial being K × 0.17 amp. For equality of current in the aerial systems the deflections work out at 19 mm with the ordinary antenna, and 113 mm with the directive aerial. The single, earthed harp was also compared (for equal antenna currents and coupling) with the ordinary vertical antenna of the station, excited in the usual man-

ner. It was found that the deflections were 35 mm and 7 mm for the harp and for the vertical antenna respectively. (a-3, b-1, c-1, d-1, e-0, f-Experimental)

68. ANONYMOUS, "A New System of Wireless Telegraphy," Scientific American Supplement; 16 July 1910. ABSTRACT: Illustrated description of the Bellini-Tosi apparatus. No. 15600. (a-3, b-2, c-1, d-1, e-0, f-Description)

69. SCHWARZHAUPT, P., "Abnormal Transmission of Electromagnetic Waves," Electrician; 26 August 1910. ABSTRACT: Abstract translation from Elek. Zeit. Reports observations of variations in intensity. No. 16952 A. (a-3, b-2, c-1, d-5, e-0, f-Translation)

70. SOMMERFELD, A., "Propagation of Waves in Radio Wireless Telegraphy," Jahrb. d. Draht., vol. 4, pp. 157-176; December 1910. ABSTRACT: An earlier paper is summarized and extended in one or two points--in particular, by a consideration of the case when the earth's surface is such that the dielectric constant may not be neglected in comparison with the conductivity. Curves are given connecting the amplitude of the function π with the "numerical distance" and also with the absolute distance, for different values of conductivity and dielectric constant. The favorable working of the latter factor is pointed out. Scales connecting "numerical distance" with absolute distance over sea water and fresh water are given and show that, for a wavelength of 2 km when the "numerical distance" is 1, the absolute distance over sea water is 7×10^4 km and over fresh water 90 km. (a-3, b-1, c-4, d-4, e-0, f-Theory)

1911

71. HOERSCHELMANN, H. VON, "The Marconi Bent Aerial in Wireless Telegraphy," Jahrb. d. Draht., ca 1911. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

72. BELLINI, E., AND TOSI, A., "Wireless Telegraph Working in Relation with Interference and Perturbations," Electrician, vol. 67, p. 66; April 1911. ABSTRACT: Letter to the editor in connection with a paper by Taylor, titled, "Wireless Telegraph Working." Bellini and Tosi do not agree with Taylor's conclusion that directive antennas are advantageous for communications over short distances and that the use of directive antennas is limited to short waves and confined to two stations communicating exclusively between themselves. (a-6, b-1, c-1, d-5, e-0, f-0)

73. PETIT, G. E., "Method of Determining the Bearing of a Radio-Telegraph Station," Lum. Elect., vol. 13, pp. 227-230; February 1911. ABSTRACT: The author describes a method of determining the direction of a transmitter. For a complete understanding of the arrangement the original diagrams must be consulted. At the receiving station two antennae (distance apart small compared with distance from transmitter) are employed in which both act inductively on a third oscillatory circuit, and each at the same time excites a tunable circuit which also acts upon the said third circuit. The result is that each antenna sets up in the third circuit two equal alternating fields of the same frequency but differing in phase: a circular rotating field is set up. Two forms of the apparatus are described. In the first form the two rotating fields are opposed and the third circuit is rotated until the signals have a maximum strength. Certain values having been previously found (for some definite wavelength) by calibration; the direction is then obtained from a simple formula. The intensity of the received signals is said not to be dependent upon the distance between the two antennae as in the case of the Bellini-Tosi system. (a-3, b-1, c-3, d-3, e-0, f-Theory and experiment)

74. BELLINI, E., AND TOSI, A., "The Hertzian Azimuthal Compass," Lum. Elect., vol. 14, pp. 227-233; May 1911. ABSTRACT: Description of the first D/F call "azimuthal hertzian compass." Principle and description of the first one used in connection with a Brown-Blondel directive antenna. Experiments with ships. (a-6, b-1, c-3, d-3, e-0, f-Qualitative description)

75. TISSOT, M., "The Determination of Longitude by Radiotelegraphic Time Signals," Electrician; 9 June 1911. ABSTRACT: Abstract of an article in La Tech. Mod. Describes experimental trials between the Eiffel Tower and Brest. No. 24505 A. (a-3, b-2, c-1, d-5, e-0, f-Description)

76. CLAUDE, A., FERRIE, G., AND DRIENCOURT, L., "The Employment of Wireless Telegraphy in the Determination of Longitudes," Rev. Gen. d. Science; 15 July 1911. ABSTRACT: The first part deals with telephonic comparisons. No. 25916 D. (a-3, b-1, c-3, d-3, e-0, f-Study)

77. DOLBEAR, B. L., AND PROCTOR, J. A., "The Effects of Sunlight on the Transmission of Wireless Signals," Elec. Wld.; 5 August 1911. ABSTRACT: Examines phenomena showing some causes of the difference between day and night intensity and other variations. Also editorial. No. 25586. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

78. WALTER, L. H., "Accuracy of the Bellini-Tosi Wireless 'Compass' for Navigational Purposes," Electrician, vol. 67, pp. 749-750; 18 August 1911. ABSTRACT: The author gives results of actual tests on the Bellini-Tosi wireless compass. (a-6, b-1, c-1, d-5, e-0, f-Qualitative description)

79. HOWE, G. W. O., "Recent Developments in Radio-Telegraphy, Electrician; 8 September 1911. ABSTRACT: Read before the British Assn. Considers the difficulties in wireless transmission due to interferences, atmospheric disturbances, etc., and recent developments for minimizing such troubles. No. 26597. (a-3, b-2, c-1, d-5, e-0, f-Evaluation)

80. BLONDEL, A., "Directed Aerials in Wireless Telegraphy," Lumière Électr., vol. 16, pp. 7-12, 7 October and pp. 131-143; 4 November 1911. See also Comptes Rendus, vol. 153, pp. 593-597; 25 September, and pp. 661-663; 9 October 1911. ABSTRACT: The author deals only with conjugate aerials, or aerials composed of two antennae, and which are capable as a unit of being set with an orientation in a particular direction. He attempts to classify such aerials, dividing them into "differential" and "summation" effect aerials, and then describes some new types in which the arrangement is inverted, i.e., the ends of the two antennae are at ground-level and the horizontal conductor joining them is high up. The theory of reception with such oriented aerials is dealt with in the second part, and the goniometric properties of such aerials are set forth. The subject is discussed in a theoretical way, and no data and no experimental results are given. (a-3, b-1, c-3, d-3, e-0, f-Theory)

81. POWELL, S. M., "The Development of Syntonic and Directive Wireless Telegraphy," Elec. Rev.; 15 December 1911. ABSTRACT: Abstract from a paper read by Lieut. Tissot at the Conf. de la Tech. Mod. Discusses syntony and its limitations, directive wireless telegraphy, etc. No. 29217 A. (a-3, b-2, c-1, d-1, e-0, f-Discussion)

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82. AUSTIN, L. W., "The Work of the U. S. Naval Radio-Telegraphic Laboratory," Jour Am Soc of Nav Engrs; February 1912. ABSTRACT: Reviews the general nature of the work. No. 31492 H (a-3, b-1, c-1, d-1, e-0, f-Survey)

83. HOWE, G. W. O., "Radio-Telegraphy," Jour Soc of Arts; 2 February 1912. ABSTRACT: Explains the general principles underlying all systems, indicating the trend of improvements during the last few years. No. 30387 A. (a-3, b-1, c-1, d-1, e-0, f-Survey)

84. KIEBITZ, F., "Wireless Telegraphy with Earth Antennae" Electrician, vol. 68, pp. 868-870; 8 March 1912. ABSTRACT: An account of further experiments in wireless telegraphy without the use of vertical aerials. Reception experiments were carried out with wave-lengths up to 6000 m, and the signals from Poldhu, Clifden, Glace Bay, and Norddeich were received. Experiments were then made with a horizontal wire 1270 m long, excited at the electrical centre as near as possible, as antenna. With a 3500-m wave, and 1 kw in the antenna it was possible to get signals through to Norddeich (405 km). The author finally reviews the special qualities of the arrangement adopted. It is pointed out that, first and foremost, the cost is very low. With wires sufficiently long, the damping resistance is very high (50-120 ohms) as compared with large umbrella antennae (5 ohms about); this allows of a close coupling being used (28 percent in the experiments). The capacity of the antenna is very small, while the damping decrement is not greater than that of the vertical antenna. Finally, for an equal output the antenna currents and potentials are very much smaller than in the case of vertical

antennae. As an example of this, it is stated that with an antenna current of 4 amps the sparks which could be drawn from the earth antennae were only a few mm in length. (a-3, b-1, c-1, d-4, e-0, f-Experimental)

85. REICH, M., "Relation between the Radiation of an Antenna and Its Shape," Phys. Zeitschr., vol. 13, pp. 228-234; 15 March 1912. ABSTRACT: Communication from the Experimental Radio-telegraphic Laboratory of the Military and Naval Department, Göttingen. The object of the experiments detailed was to determine the dependence of the radiation decrement upon the form of the antenna. The method employed was to measure the effective current, the decrement, and the capacity of the sending antenna while varying the shape of the antenna. At the same time measurements of received current were made at a receiving antenna tuned to the transmitter. During a series of tests the wave-length of the antenna was kept constant, any variation in capacity and inductance due to alteration of shape being compensated for by a variometer. If J be the effective current in the sending antenna, J_ϵ that in the receiver, W the antenna equivalent resistance, then in unit time J^2W is the energy in the antenna and J^2W_s is the radiated energy, W_s being the radiation resistance. The energy in the receiving antenna is measured by J_ϵ^2, and this increases with increase of J^2W_s, assuming that the distribution in space of the radiaten energy remains constant. The ratio J_ϵ^2/J^2 forms also a scale for fixing W_s. The sending antenna consisted of three horizontal members which could be raised or lowered, and tables are given showing the variation in the antenna constants as the shape was so varied. The receiving antenna was coupled to a Duddell thermo-galvanometer and the transmitting aerial impact excited. A series of experiments was made with the transmitting aerial earthed and also with a counter capacity. The results are tabulated and are compared with deductions on theoretical grounds. It is not possible to usefully abstract the tables or reproduce the curves accompanying the paper, and it should therefore be referred to. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

86. POWELL, S. M., "Wireless Telegraphy in Horology, Navigation and Cartography," Elect. Rev.; 5 April 1912. ABSTRACT: Notes from articles in La Lumière Elec and the Supplement to La Tech. Mod. Its use in the transmission of time signals and the determination of differences of longitude. No. 31908 A. (a-3, b-2, c-1, d-5, e-0, f-Excerpted abstract)

87. HARMON, D., "Girdling the Globe by Wireless," Sci. Am.; 20 April 1912. ABSTRACT: An illustrated account of the plan of the U. S. Navy Department to construct a chain of wireless stations connecting two oceans and a continent. No. 32172. (a-3, b-2, c-1, d-1, e-0, f-Description)

88. ZEHNDER, L., "On the History of Earth Aerials," Jahrb. d. Draht., vol. 5, p. 594; May 1912. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

89. BREDOW, H., "Radiotelegraphy with Special Regard to Ship Installations," Engineering; 3 May 1912. ABSTRACT: Abstract translation of a paper read before the Schiffbautechnische Gesellschaft. Remarks on development and matters relating to ship stations. No. 32885 A. (a-3, b-2, c-1, d-1, e-0, f-Translation)

90. ANONYMOUS, "The Telefunken Compass," Electrician, vol. 69, pp. 269-271; 24 May 1912. ABSTRACT: This apparatus depends in principle upon the star-shaped arrangement of horizontal aerial wires employed by Marconi. In the present case 32 horizontal directional aerials, to correspond with the points of the compass, are arranged radially, at a land station, and a motor-driven commutator makes connection with each aerial in turn, at the rate of one complete revolution per half-minute. A series of single-dot signals are sent out at such a rate that, after a preliminary "time" signal sent by a non-directive aerial, a single dot is given by each directive aerial. At the receiver, on receipt of the time signal a stop watch, graduated in points of the compass, and starting from the direction N-S, is started, and is stopped on the signals received having a minimum strength. In order to judge as to this minimum, it is obvious that several complete revolutions must be waited for, and 5 minutes is given as the time necessary to get an average value of higher accuracy (10 measurements). The use of directive antennae on board ship is considered undesirable, and in support of this it is stated that very short wave-lengths have to be used with the Bellini-Tosi compass, although this is by no means the case. (a-3, b-1, c-1, d-5, e-0, f-Experimental)

91. KIEBITZ, F., "Directed Wireless Telegraphy," Jahrbuch d. Drahtlosen Telegraphie, vol. 6, pp. 1-9; July 1912. ABSTRACT: Communication from the Kaiserl. Telegraphenversuchsamt. At the beginning of the paper a résumé is given of the various methods of directing wireless radiation, and then certain experiments are described in which earth antennae are used for sending and receiving in specified directions. In one case four antennae 120 m long are stretched horizontally E, W, N, S, from the receiving apparatus, their further ends being connected to the inside of Leyden jars, of which the outsides are earthed. By using different pairs of the antennae the direction of various well-known sending stations is determined. The direction as determined in this way is not in every case correct, and it varies from day to day. The condition of the earth's surface between the two stations is responsible for the variation. Observations made by night are in some cases quite different to those made by day. The cause of the difference is not determined. On the shore at Swinemunde a wire 200 m long with the receiving apparatus in the middle was stretched and turned round about its centre. In this way the direction of Norddeich, 470 km away, was determined, but the error varied from 10° to 20°, the wave-front having been turned by the sea. Such wires were also used for sending to certain well-known stations. If the ends of the horizontal antennae are free, the effective sending distance is less that that of a simple antenna, but it is greater if the ends are connected to the inside of Leyden jars, of which the outsides are earthed. At the end of the paper theory explaining the directive action of the arrangement is given. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

92. BURSTYN, W., "The Action of Earth Antennae," Jahrbuch d. Drahtlosen Telegraphie, vol. 6, pp. 10-13; July 19. See also Elektrotechn. Zeitschr. vol. 33, pp. 615-616; 13 June 1912. ABSTRACT: The author maintains that the action of a Kiebitz earth antenna cannot be explained as being dependent on conduction through the ground but that propagation takes place through the air. The directive action is explained as due to the two dipoles formed by the ends of the antennae and their electric images in the earth, the reflecting surface, however, being not the surface of the ground but the ground water below the surface. Definite surface conditions are therefore necessary for effective action. The ground water must neither be too near the surface nor too far below it. The experiments of Kiebitz were carried out on sandy soil. It is doubtful if an antenna stretched along the surface of the sea would be effective. (a-3, b-1, c-4, d-4, e-0, f-Theory)

93. DIECKMANN, M., "Wireless Telegraphic Orientation and Meteorological Information from Airships," Jahrb. d. Draht., vol. 6, p. 51; July 1912. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Mentioned in Keen)

94. DIECKMANN, M., "Wireless Telegraphy for Airships; Telefunken System," Telefunken Zeitung, No. 5; 1912. See also Jahrb. d. Drahtl. Tele., vol. 6, pp. 70-85, July 1912. ABSTRACT: An illustrated description of the Telefunken equipment for use on airships. The weight of the apparatus is about 70 kg, that of the alternator and exciter 55 kg: total, 125 kg. (a-3, b-1, c-4, d-4, e-0, f-Description of equipment)

95. TESLA, NIKOLA, "The Disturbing Influence of Solar Radiation on the Wireless Transmission of Energy," Elec Rev & W Elect'n; 6 July 1912. ABSTRACT: Presents new ideas in regard to the propagation of electrical waves through the air. No. 34299. (a-3, b-2, c-1, d-1, e-0, f-Propagation study)

96. ECCLES, W. H., "On the Diurnal Variations of the Electric Waves Occurring in Nature," and "On the Propagation of Electric Waves Round the Bend of the Earth," Proc. Roy. Soc., vol. 87, pp. 79-99; 13 August 1912. ABSTRACT: Observations on relative strengths of received static signals as a function of time of day are given. It is shown that daily variations of signals received from large distances may be accounted for by a Heaviside layer. (a-6, b-1, c-1, d-5, e-0, f-Experiment and theory)

97. MOSLER, H., BURSTYN, W., HAUSRATH, H., AND KIEBITZ, F., "Earth and Under-Water Antennae," Jahrb. d. Draht. vol. 6, p. 359; September 1912. ABSTRACT: Correspondence on the stated subject. (a-4, b-1, c-4, d-4, e-0, f-Correspondence)

98. ECCLES, W. H., "Phenomena Accompanying the Propagation of Electric Waves," Electrician, vol. 69, pp. 1015-1019; 27 September 1912. ABSTRACT: Paper read before the British Assoc. at Dundee.

From the conclusions in this paper, it is shown that the concentration of ions due to solar radiation must increase as distance from the earth increases, and it is not unreasonable to suppose that practically all the ions in the middle parts of the atmosphere are due to solar radiation; as a consequence the velocity of electric waves will increase as height above the earth increases. A nearly vertical wave-front will tilt forward as it travels horizontally through the middle portion of the atmosphere. At any particular place on the earth's surface the ionisation in the middle and lower atmosphere increases up till noon and diminishes after. At sunrise there will be a great formation of ions, and at the boundary of light and darkness in the atmosphere there is a more or less abrupt change in the electrical conditions of the medium through which waves have to pass. Scarcely any of the phenomena described can be explained without assuming that there exist in our atmosphere some permanently ionised upper layers capable of reflecting electric waves - a hypothesis put forward by Heaviside. The author deals with a number of authenticated instances of waxing and waning of signals and with the question of "strays." The paper is too long to be usefully abstracted. (a-3, b-2, c-1, d-5, e-0, f-Propagation study)

99. MARCH, H. W., "The Propagation of the Waves of Wireless Telegraphy around the Earth," Wireless Engnr.; October 1912. ABSTRACT: An explanation of the process by which wireless telegraphy overcomes the curvature of the earth. No. 37024 C. (a-3, b-1, c-1, d-5, e-0, f-Propagation study)

100. ANONYMOUS, "Recent Developments in Wireless Telegraphy: With Special Reference to Ship Installations," Elect. Revue, Lond.; 18 October 1912. Serial. 1st part. ABSTRACT: Notes on statements made by Dr. H. Bredow in a communication to the 1912 Jahrbuch der Schiffbau techniker Gesellschaft. Strongly favors the Telefunken system. No. 37066 A. (a-3, b-2, c-1, d-5, e-0, f-Survey)

101. ADDEY, F., "Directive Wireless Telegraphy," Electrician, vol. 70, pp. 586-588; 27 December 1912. See also Elektrotechn. Zeitschr., vol. 34, pp. 534-535; 8 May 1913, and Rev. Electrique, vol. 19, pp. 392-395; 18 April 1913. ABSTRACT: The chief feature is a description of the Bellini-Tosi "compass," as modified by E. Bellini and now manufactured by the Marconi Co. The two inclined aerial systems consist of triangles of a single wire, the two sides of the triangle being now joined at the top and not left open as formerly. At the lower mid-point, where connection is made to the radio-goniometer coils, a variable condenser is inserted in each aerial system. Diagrams are given of the connections of the apparatus as fitted on the Folkestone-Boulogne steamer Onward. The height of aerial is 12 m, and the half-base of the triangle 6.5 m. A carborundum-steel detector is used. Two kinds of circuit are provided, one for unskilled and the other for skilled operators. The arrangement with condensers has the advantage that it is no longer necessary that the dimensions of the aerials should be comparable with the length of wave to be received. Thus signals are received on one of the standard lengths, 600 m. (a-3, b-1, c-1, d-0, e-0, f-Description of equipment)

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102. WITOLD AND RYBCZINSKI, W. V., "On the Propagation of Radio Electric Waves round the Earth's Sphere," Ann. der. Phys., vol. [illegible], p. [illegible]; 1913. ABSTRACT: Not available. (a-6, b-1, c-4, d-4, e-0, f-0)

103. TODD, D. W., "The Arlington Radio Station," Jour Am Soc of Nav Engrs; February 1913. ABSTRACT: Illustrated detailed description of this station and its equipment, with related subjects of interest. No. 40859 H. (a-4, b-1, c-4, d-4, e-0, f-0)

104. KIEBITZ, F., "Refraction of Electric Waves by the Atmosphere," Jahrb. d. Draht., vol. 7, p. 154-157; June 1913. ABSTRACT: A calculation is made as to the refraction of electric waves by the atmosphere on the assumption that the density of the air falls off proportionally to the height. It is shown that this regular refraction greatly assists the waves in passing round the earth's surface, and that owing to the presence of water-vapour the effect is greatest over the sea. Irregularities in the density and moisture of the atmosphere cause irregular refraction, which is unfavourable to the regular propagation of the waves. These irregularities are most prevalent over land and during the day, and they have a greater effect on short waves than on long waves. The author therefore considers that, although other influences may be important in determining the range in wireless telegraphy, it is probable that refraction of the waves by the atmosphere may have a greater effect than is commonly assumed. (a-3, b-1, c-4, d-4, e-0, f-Theory)

105. KENNELLY, A. E., "The Daylight Effect in Radio Telegraphy," Proc. IRE, vol. 1, no. 3, pp. 39-52; July 1913. ABSTRACT NO. 1: A theory of upper-air ionization is advanced to explain the distance of long-distance transmission of radio waves. Some experimental data are included. ABSTRACT NO. 2: The author arrives at the conclusion that the changes of intensity of signals near sunrise and sunset are explained by reflecting effects which may be expected at the boundary surface or "shadow wall" between darkness (air of small conductivity) and illumination (air of marked conductivity). The theory and recorded observations are found to be in reasonable agreement. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Theoretical analysis)

106. KIEBITZ, F., "Transmission Experiments, with Grounded Antennas," Electrician, vol. 71, pp. 608-610; 18 July 1913. See also Jahrb. d. Draht., vol. 6, p. 554. ABSTRACT NO. 1: The author gives a detailed account of further experiments with earth antennae arrangements. Earlier results and conclusions are confirmed. The article must be consulted in its entirety as no useful short abstract is possible. ABSTRACT NO. 2: A statement of results of experimental transmissions, on wavelengths between 1000 and 2000 meters, using grounded antennas. (a_1-3, a_2-6, b-1, c-1, d-4, e-0, f-Experimental study)

107. ECCLES, W. H., "Atmospheric Refraction in Wireless Telegraphy," Electrician, vol. 71, pp. 969-970; 19 September 1913. ABSTRACT: A paper in which theory is developed to explain the bending of electric waves round the earth on the ground of the varying ionisation of the atmosphere. The fundamental theorem is that the velocity of electric waves through a gas is increased by the presence of ions of molecular size in the gas. The velocity of long electromagnetic waves will thus exceed the velocity of light in an ionised medium. It is explained in a simple manner how this is the case. The trajectory of rays in an atmosphere, in which the index of refraction varies in a particular manner with the distance from the centre of the earth, is then examined. The theory gives a result which does not agree very well with the result which Austin and Cohen's empirical formula furnishes, but the absorption is supposed to be nil, and the assumed variation of the refractive index probably only roughly represents the truth. (a-3, b-1, c-1, d-5, e-0, f-Theoretical analysis)

108. BARTON, E. H., AND KILBY, W. B., "The Effect of Ionization on Electrical Oscillations and Its Effect on Long-Distance Wireless Telegraphy," Phil. Mag., vol. 26, pp. 567-578; October 1913. ABSTRACT: A discussion of the theory of long-distance radio wave propagation due to increased speed of propagation resulting from ionized layers of air. Experimental methods for investigating the phenomenon are suggested. (a-6, b-1, c-1, d-5, e-0, f-Experimental study and theoretical analysis)

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109. DEMMLER, O., "Measurements of the Speed of Diffusion of Electric Waves on the Surface of the Earth," Archiv f. Elektrot., vol. 3, pp. 107-110; 1914. Communication from the German Telegraph Experiment Station. ABSTRACT: The author used two parallel wires, 940 m in length, supported on wooden masts at a height of 1 m above the ground and provided with an earth connection at one end, such connection being capable of being made or broken by means of a switch. The earth consisted of zinc strips 25 cm broad, joined to wire nets 25 m long and 1 m wide. The ground below the aerial for 720 m was level damp moor, and for 220 m the aerial passed over a sand hill. Successive series of measurements at various wavelengths were taken with the wires grounded and ungrounded. The system was excited by a buzzer. The results given in tables show fair agreement between calculated and observed wave-lengths. Experiments were also carried out with shorter lengths of aerial. The general conclusion is that when the earth is employed there is a diminution in the velocity of wave transmission. Whereas without earth the speed is that of light, with earth the ratio is 1.24:1 to 1.11:1. If the dielectric constant of the earth be represented by ϵ, then the speed is $(1/\sqrt{\epsilon}) 3 \times 10^{10}$ cm/sec. For dry earth ϵ may vary from 2 to 6. In the author's experiments, some of which were carried out over the wet soil and the dry sand respectively, he found a marked difference, which he attributes to the fact that the sand is a dielectric and the wet soil a conductor. (a-3, b-1, c-4, d-4, e-0, F-Experiment)

110. BRAUN, F., "On the Replacement in Wireless Telegraphy of Open Circuits by Closed Ones," Jahrb. d. Draht., vol 8, p. 1; January 1914. ABSTRACT: Experiments were carried out with closed oscillation receiver circuits in order to see in what manner they may be used instead of the usual open type. At first a large rectangle of several turns of wire with a variable capacity at its centre was used. This was hung from a tower at some height above the ground. The experiments were conducted in Strassburg and the signals observed were those of the Eiffel Tower, with which station the circuit was set in resonance. By turning the coil through 180° the direction of the incident radiation is easily determined. The strength of the signal received was determined with unipolar detector and telephone by the shunted telephone method. Such a closed circuit may therefore be used to determine the strength and direction of waves, and also the absorption of the waves and the effect of land obstacles. Wave-length may be determined by using two coils connected together and varying the distance between them in the direction of the incident waves. A simple rectangle with its plane vertical, closed to an oscillation circuit with a capacity in one of the vertical sides was then employed, the height of the rectangle being about 50 ft and its length about 80 ft. The arrangement was in the shadow of a large building and under these circumstances gave much better signals than an open sender of the same vertical height. The best form and dimensions of the closed circuit is investigated theoretically. (a-3, b-1, c-4, d-4, e-0, f-Experiments. See Abstract No. 2766)

111. HOWE, G. W. O., Discussion on "Effect of Ionization of Air on Electrical Oscillations and Its Bearing on Long Distance Wireless Telegraphy," Phil. Mag., vol. 27, pp. 213-215; January 1914. ABSTRACT: This paper is a comment on results obtained by Barton and Kilby on the effects of ionisation of air on electrical oscillations. The paper referred to cannot be taken to support Eccles' theory of the refraction of electromagnetic waves, since that theory requires that the ion be free from frictional resistance, whilst the experiments were carried out at atmospheric pressure. It is suggested that experiments in various vacua would have a better bearing on the theory. (a-3, b-1, c-1, d-5, e-0, f-Theory)

112. FLEMING, J. A., "Atmospheric Refraction and Its Bearing in the Transmission of Electro-Magnetic Waves round the Earth's Surface," Proc. Phys. Soc., vol. 26, p. 318; August 1914. ABSTRACT: The mathematical investigations of H. M. Macdonald and of March and v. Rybczyński show that true diffraction can account for part only of the effect at the distant receiving station. Some part appears also to be transmitted along or through the earth's crust, but that this cannot be the major part is shown by the influence of atmospheric changes in respect to solar illumination. Observation points to some continually fluctuating atmospheric condition as a principal factor. The author here deals with the conditions under which true atmospheric refraction would be sufficient to carry radiation emitted horizontally from any point on the earth's surface round the earth parallel to the surface. W. H. Eccles has provided the foundation for a valid theory of ionic refraction on the basis of the theoretical conclusion that in ionised air the velocity of long electric waves is increased. And the upward decrease in atmospheric density decreases the refractive index, and so increases the velocity. Formulae are obtained expressing this variation of density with height, including the effect of the known temperature variation, and it is shown that at a height of 100 km the earth's atmosphere must consist substantially of H and He. An expression is then obtained for the radius of curvature at any point of a light-ray emitted horizontally from the earth's surface, its value at the starting-point being given by the formula $\rho = \mu_0/98Aq^2$), where μ_0 and q_0 are the refractive index and density at the earth's surface, and A is the Gladstone and Dale constant, $(\mu_0 - 1)/q$, for the gas forming the atmosphere. From the known values of the constant for various gases it is shown that for air ρ is four times the earth's radius, for H 136 times, and for Kr equal to the earth's radius. If, then, the earth's atmosphere consisted wholly of Kr, a ray emitted horizontally would be refracted round the earth, and radio-telegraphy to the Antipodes would be possible. These formulae are obtained in three different ways. They show further that this circular refraction would occur if the density of the earth's atmosphere were doubled, while the constant A remained unchanged, or on a planet of double the earth's diameter with an atmosphere similar to our own. On a large planet such as Jupiter, with a dense atmosphere, no ray of light emitted at or near the horizontal direction at any point could escape from the atmosphere. The considerable evidence that many lines in the aurora spectrum are due to the more volatile constituents in the air suggests the possibility that the nonvalent gases Ne and Kr are manufactured by electric discharges in the rarefied hydrogen atmosphere at great heights, and that by their ease of ionisation they contribute to the production of the ionised layer required by the theories of Heaviside and Eccles to account for the actual achievements of radio-telegraphy. (a-3, b-1, c-1, d-5, e-0, f-Theory)

113. BELLINI, E., "The Possibility of Sharply-Directive Wireless Telegraphy," Electrician, vol. 74, pp. 352-354; December 1914. ABSTRACT: Radiation patterns of several simple types of antenna arrays are presented and discussed. The author shows that combinations of arrays can be made to give greater gain than the simple structures. Huygen's principle is used for calculating the directivity of certain types of arrays. (a-6, b-1, c-1, d-5, e-0, f-Experimental study and theoretical analysis)

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114. *ZENNECK, J., "Wireless Telegraphy," McGraw-Hill; 1915. ABSTRACT: Not available. (a-4, b-6, c-1, d-4, e-0, f-0)

115. ARTOM, A., "Directivity of Electric Waves," Accad. Lincei, Atti, vol. 24, pp. 42-47; 21 January 1915. See also Elettrotecnica, vol. 2, pp. 202-204; 25 March 1915. ABSTRACT: A short description is given of some known directive aerials and some of the results obtained are stated, but without any supporting data. The aerials considered are of triangular form and symmetrical with regard to an axis, generally vertical, the currents in the two branches being equal and of opposite phase. A kind of aerial to which special attention is drawn by the author is triangular, but contained in a plane inclined to the vertical. This aerial is said to give a unilateral diagram of an egg-shaped form (sic). It is, moreover, asserted that the shape of the supposed diagram can be changed by varying the relative positions of the two branches of it. (a-3, b-1, c-9, d-9, e-0, f-Experiment)

116. LEIMER, E., "On Radium Antenna Influence of the Proximity of Radium upon Signal Reception," Elekt. Zeits., vol. 36, p. 94; February 1915. ABSTRACT: The author describes how, when he was merely repeating an experiment on indoor reception with a makeshift "antenna" consisting of a 3-M wooden rod closely wound with 0.2 mm diameter enamel covered wire, no signal whatever could ordinarily be heard from a sending station about 300 km distant; and yet, on bringing up near to the antenna a glass tube containing 0.01 gm of radium bromide (of 50,000 units activity only), signals at once became quite audible. The signals ceased when the telephones (of 4000 ohms resistance) were shunted with 220 ohms. This behaviour was confirmed by experiments in which a parallel wire antenna was used, and a galvanometer in place of the telephone receivers. The current through the galvanometer without radium was 20-21 microamps; with radium brought near to the free end of the antenna 50-53 microamps was observed (a shift in the tuner adjustment was required to get this maximum). This effect is also produced when the radium is brought near the other end of the antenna but no effect when the radium tube is placed at the mid-point of the antenna. When the radium is brought near the tuning coil the effect seems to be distinctly prejudicial to the quantity of the reception. (a-3, b-1, c-4, d-4, e-0, f-Experimental)

117. MARCHANT, E. W., "Conditions Affecting the Variations in Strength of Wireless Signals," JIEE, vol. 53, pp. 329-340: Discussion, pp. 340-348; 1 March 1915. See also abstracts in Engineering, vol. 99, pp. 232-236; 19 February 1915; Electrician, vol. 74, pp. 621-624; 12 February 1915. ABSTRACT: The author has carried out a series of observations of the effect of atmospheric conditions of all kinds on the strength of signals. The observations made over a period of a year were confined to watching the variations at sunset and at night in the strength of signals. Measurements were made between Liverpool and Paris which lie mutually almost north-west and south-east. The aerial employed was of an L-shape with a horizontal length of over 500 ft and a vertical height above ground of 150 ft. The earthing system consisted of a ring of two 3-in. water pipes laid in the form of a square of about 50 ft side. The earth wire was connected to one side of these pipes and they were in turn connected to the water-pipe system of the building. The coupling between the aerial circuit and the receiver circuit varied within wide limits. For most records it was 3.75 percent. The current received by the antenna was estimated from the current flowing through the crystal circuit; records were made by means of an Einthoven galvanometer. In connection with each test of signal strength a calibration of the crystal sensibility was made by means of the buzzer. In each case the current flowing in this circuit was measured by a Duddell thermo-ammeter, and the corresponding current in the galvanometer circuit observed. A number of curves are presented illustrating the effect of sunset on signal strength, signal strength for different months in the year, days of the month, and times of the day and night. The paper concludes with two appendices, one giving an approximate method for estimating the antenna current from the current in the detector circuit for loosely coupled receivers; and the second a method for estimating the current in the buzzer circuit. In the discus-

sion, W. Duddell drew attention to H. Abraham's moving-coil galvanometer in which a sensibility of the order of 100 to 12? mm per microamp is obtained with a periodic time of 1/10 second. R. N. Vyvyan mentioned ranges of 2500 miles for 1-1/2 kw, stations obtained in a certain area outside Melbourne. J. E. Taylor suggested that in the atmosphere there is normally a very considerable electric field due to the normal potential gradient of the atmosphere, then the exposed antenna of a wireless station has an appreciable field due to this atmospheric gradient located on it. That superposition of the atmospheric potential gradient has in effect the property of greatly increasing the spread of the electric field from the antenna in an upward direction. This gives rise to what he calls a high-level component of the radiation that will start effective radiation high up in the atmosphere far above the limits of the antenna alone. The effects of this atmospheric field make themselves felt by their variations, the more rapid of which produce disturbances on a receiving antenna. J. A. Fleming submitted a diagram showing variations in signal strength under different weather conditions for July 1914. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

118. CULVER, C. A., AND RINER, J. A., "Radio-telegraphy without Elevated Antennae," El. World, vol. 65, pp. 723-726; 20 March 1915. ABSTRACT: The paper describes extended tests mentioned in an earlier paper. In addition to a telephone line 250 m in length and 3 m high referred to previously, a second low horizontal system was established, consisting of a single wire of approximately the same length and height, but extending in a SE instead of a southerly direction. On November 17, 1913, a heavy mist prevailed and everything was thoroughly wet. Owing to poor insulation the line was earthed at one point at least and probably at others, but even under these conditions signals from Atlantic coast and other stations were heard at Beloit. At 7:26 p.m. on November 23 Arlington was heard sending longitude signals to Paris, and this when using either the telephone line or the special low horizontal antennae. As a result of the preliminary tests it was decided to carry out further experiments of a similar character over distances comparable to those occurring in radiotelegraphic practice. A series of tests were carried out between Beloit and a temporary field station at Freeport, the distance covered being 34 miles approximately. Signals of fairly constant intensity were sent out from Beloit on a 900 m wave and received by the field station at Freeport. The log decrement of Beloit on the above wave-length is about 0.16. No facilities for quantitative measurements were, however, available at Freeport. Experiments were made to determine the optimum length of wire at the receiving antenna when receiving on a 900-m wave. A further series of tests were made to determine the directive effect of the ground antenna, and a number of the experimental arrangements are illustrated diagrammatically in the paper. As a result of the experiments several facts stand out more or less clearly. The authors believe that this is the first time that electric waves have been received successfully over commercial distances by using single, bare wires, placed directly on the ground. Further, the experiments show that symmetrical multiple earth-wire systems may be used for receiving in practical radio-communication, without necessitating increase in sending power over that employed when utilising ordinary elevated antennae. Such systems appear to operate most effectively when their electrical length, including the winding on the transformer, is something like 1.4th of the incident wave. When used as an absorber, insulation of the wires apparently plays a minor part. It remains to be determined whether similar arrangements may be used over commercial distances as radiators, and the authors are continuing their experiments on these lines. (a-3, b-1, c-1, d-5, e-0, f-Experiment)

119. ZENNECK, J., "An Arrangement for Directive Wireless Telegraphy," Jahrb. d. Drahtl. Tele., vol. 9, pp. 417-424; April 1915. ABSTRACT: From the various arrangements for directive wireless telegraphy, two have shown themselves to possess remarkably satisfactory long-range characteristics. One is the bent antenna of Marconi. Its range characteristic depends upon the relation between the length of the horizontal to that of the vertical portions. According to v. Hörschelmann the amplitude of the electric field at the earth's surface in any given direction making an angle with the direction of max. transmission, is given by the equation $E_0 = Eh_0\sqrt{1 + \beta^2 \cos^2\alpha} + \sqrt{2} \cdot \beta \cos\alpha$, where Eh_0 is the amplitude of the field strength of the vertical portion of the antenna in the same distance, and $\beta = \ell/(h\sqrt{2\sigma\lambda c})$; here ℓ = length of horizontal portion, h = length of vertical part of the antenna, σ = conductivity of the earth, λ = wave-length, c = velocity of light, all in cgs units. The second arrangement consists of two antennae with oscillations having a given phase-difference. If the phase-difference ϕ between the two antennae at distance d satisfies the relation $\phi = \pi + 2\pi d/\lambda$, then the arrangement has a suitable range characteristic. Curves given in the paper for various parameters show that the bent antenna for values of $\beta > 1$ has very little side radiation but has some radiation in the opposite direction to that of principal radiation. With the double antenna, the back radiation vanishes entirely, but there is a considerable amount of side radiation. The author has calculated the case for a combination of the two types and the resulting curves, and finds that as compared with the double antenna, the side radiation is considerably reduced, while, compared with the Marconi antenna it has the advantage of practically zero back-radiation. The new combination is naturally more complicated than the Marconi antenna, but this is somewhat reduced from the fact that both antennae of the combination need only have half the range of a single Marconi antenna. The production of the necessary phase-difference is easily accomplished by employing H/F alternators. F. Braun has designed an arrangement, using four antennae placed at the corners of a rectangle of breadth $\lambda/4$ and length $\lambda/2$, which gives very perfect results. (a-3, b-1, c-4, d-4, e-0, f-Theory)

120. FLEMING, J. A., "On the Causes of Ionization of the Atmosphere," Electrician, vol. 75, pp. 348-350; June 1915. ABSTRACT: In connection with the propagation of electric waves the author considers the production of a permanently ionized layer in the earth's atmosphere by light-propelled ions from the sun. He thus adds weight to Eccles' arguments concerning the existence of the Heaviside layer and questions the followers of "diffraction-round-the-earth theory." (a-3, b-1, c-1, d-5, e-0, f-Theoretical analysis)

121. BELLINI, E., "Range of Directive Aerials," Lum. Élec., vol. 30, pp. 1-6; 3 July 1915. ABSTRACT: Discusses the best form to be given to the Blondel type of aerial, and shows that the main object is to arrange that the current loops are in the vertical portion or the portion having a vertical projection. An example is given to show the advantage accruing as a result of raising the current loops by the use of zigzag lengthening wires. For an average ship's antenna of triangular form and of 15 m side the triangle closed at the apex is superior to the open form for waves of length 300 and 600 m. (a-3, b-1, c-3, d-3, e-0, f-Theory)

122. BELLINI, E., "Some Details of Direction Finders," Electrician, vol. 75, pp. 776-778; August 1915. ABSTRACT: Description of Bellini-Tosi system with improvements by the Marconi Company. Effect of unbalance between tuning condensers; pattern distortion due to close coupling of the D/F to the loops; effects of connecting wires. (a-3, b-1, c-1, d-5, e-0, f-Equipment description)

1916

123. BELLINI, E., "A Note on the Direction Finder," Jahrb. d. Draht., vol. 11, p. 281; 1916. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

124 ANONYMOUS, "A Unilateral Directive Aerial," Engineer, vol. 121, p. 165; 18 February 1916. ABSTRACT: The aerial is formed by the superposition of an ordinary directive frame aerial and of an aerial composed of two other frames, connected either in series or in parallel so as to form a system comprising three vertical conductors contained in the same vertical plane, one of these conductors being in the axis of the station and the two others being symmetrical to it; the current intensity in these latter is half of that in the centre conductor and of opposite phase. No appreciable coupling exists, therefore, between the two aerials. The double-framed aerial produces an electromagnetic field the diagram of the intensity of which is about of the shape of an 8, the phases being the same for the two halves of the 8. The single-framed aerial produces, as is known, an electromagnetic field, of which the diagram is also 8-shaped, but the phase of one half of the 8 is the opposite of that of the other half. Moreover, if the currents in the two aerials are in phase, between the radiations of the two aerials there will be a phase-difference of 90 deg. The superposition of the two aerials may, therefore, produce the result of increasing the radiation to one side and of diminishing it on the opposite side. In all cases the radiation is nil at 90 deg. For suitable current intensities and phases and dimensions of the aerials, the backwardly directed radiation can be reduced to zero. This result is obtained when the currents in the two aerials differ in phase by 90 deg and when the intensities of the electromagnetic fields are equal in the plane of the aerials. This unilateral aerial can be employed either for transmission or for reception. In both cases a phase-shifting device is required. The arrangement is due to Marconi's Wireless Telegraph Co., Ltd., and C. S. Franklin. British Patent 24,098 of 1914. (a-3, b-8, c-1, d-5, e-0, f-Description)

125. TAYLOR, A. H., AND BLATTERMAN, A. S., "Variations in Nocturnal Transmissions," Proc. IRE, vol. 4, pp. 131-148;

April 1916. ABSTRACT: An account of experiments made in an attempt to test the interference theory of fading. (a-6, b-1, c-1, d-1, e-0, f-Experimental study)

126. CULVER, C. A., "Notes on Radiation from Horizontal Antenna," Proc. IRE, vol. 4, pp. 449-453; October 1916. ABSTRACT: Continuing previous work, the author carried out a series of experiments on the radiation efficiency of low horizontal antennae. From the results obtained, it was evident that a horizontal system can be comparable in radiating efficiency to the standard vertical antenna, for a direction more in line with the plane of the horizontal antenna. The low horizontal antenna has a very low radiation efficiency in directions which make substantial angles with its own plane. It was noted, however, that the system would respond to incident radiation from directions in which it would not radiate. Experiments show, however, that the ground antenna is comparatively inefficient as a receiving system in directions other than its own plane. A series of experiments are being arranged for whereby it is hoped to be able to determine the polar radiation curve for a horizontal system placed within a few cm of the ground. It is also proposed to determine the optimum arrangement of the component parts of such an antenna when used as a radiator. (a-3, b-1, c-1 d-1, e-0, f-Experimental)

127. BULLARD, W. H. G., "Arlington Radio Station and Its Activities in the General Scheme of Naval Radio Communication," Proc. IRE; October 1916. ABSTRACT: A detailed description. (a-3, b-1, c-1, d-1, e-0, f-Description)

128. MARCHANT, E. W., "The Heaviside Layer," Proc. IRE, vol. 4, p. 511; December 1916. ABSTRACT: The wide and often very rapid variations in strength familiar to all radio operators are most easily explained by reflection and refraction from moving masses of "cloud," or ionic fog, in the higher atmospheric regions, forming portions of what is commonly known as the "Heaviside Layer," of which the author here gives a partial bibliography. The chief phenomena requiring further explanation are the nocturnal variations in signal strength and the comparatively small change in wave-length which often suffice to cause relatively enormous changes in the strength of received signals. Fuller's recent experiments are discussed in the light of the surface wave theory developed by Sommerfeld, which accounts for long-distance transmission but does not afford any explanation of these sudden changes, and the conclusion arrived at is that the Heaviside Layer consists, in all probability, of large and quite irregular masses, and that the changes in question can be ascribed to the effect of varying reflection, probably supplemented by refraction, from these irregular and ever-changing masses. (a-3, b-1, c-1, d-1, e-0, f-Theory)

1917

129. BROSSIER, "Errors in Wireless Bearings Using the B-T System," Note d. Etabl. Central d. Mat. Rad., no. 2829; 1917. ABSTRACT: Not available. (a-4, b-3, c-3, d-3, e-0, f-0)

130. HART, F. A., "Measurements of Radio Antenna on Shipboard and Some Interesting Comparisons," Electrician; 8 June 1917. ABSTRACT: Data of interest to marine engineers and advanced experimenters, especially in the case of aerials erected on roofs. (a-3, b-2, c-1, d-5, e-0, f-Analysis)

1918

131. JOLY, J., "A Method of Avoiding Collision at Sea," Proc. Roy. Soc., vol. 94, pp. 547-560; August 1918. See also Phil. Mag., vol. 36, pp. 1-36; July 1918. ABSTRACT: A method involving the simultaneous emitting of acoustical and electromagnetic signals. (a-4, b-1, c-1, d-5, e-0, f-Description)

132. ANONYMOUS, "Balanced Aerial System W/T Direction Finding," H. M. Signal School, R. N. Barracks, now Admiralty Signal Establishment, London, England; October 1918. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Probably an equipment description)

133. BENNETT, E., "Feasibility of the Low Antenna in Wireless Telegraphy," Proc. IRE, vol. 6, pp. 237-265; Disc., pp. 266-273; October 1918. ABSTRACT: This paper supplements a previous publication entitled "High versus Low Antennae in Radio Telegraphy," in which it is shown that if the antenna of a radio-telegraph station consists of an extended horizontal network of wires mounted above a highly conducting plane, and if the mean radius of the capacity area is two or more times as great as any height above the plane at which it is feasible to mount the network, then the rate of radiation from the antenna at a given voltage and frequency, and the rate at which the antenna will ultimately be able to abstract energy from impinging (sustained waves), are both independent of the mounting height. The conclusions in the previous paper are the result of a mathematical analysis for the hypothetical case in which the antenna is mounted over a highly conducting plane. The present paper deals mainly with those wasteful antenna and earth resistances which are common to the use of the low antenna both in sending and receiving. The distinction between the "low" antenna and the "ground" antenna is pointed out. The electrical constants of an antenna having the same radiation figure of merit as the Darien (Canal Zone) antenna, but mounted at an elevation of only 10 m (33 ft) are contrasted with those of the Darien antenna. The wasteful resistances of this 10-m Darien-equivalent are then computed. Of these losses, that the vegetation growing under the antenna is found to be most serious. The efficiency of the 10-m Darien-equivalent antenna, with its lower capacity area not buried but mounted above the ground, is computed to be of the order of 76% for frequencies of 120,000 cycles per sec and 28% for 30,000 cycles. These efficiencies are slightly lower than those reported for existing high-power elevated antennae. (a-3, b-1, c-1, d-1, e-0, f-Theory)

134. WATSON, G. N., "The Diffraction of Electric Waves by the Earth," Proc. Roy. Soc., vol. 95, p. 83; 7 October 1918. ABSTRACT: The earth is supposed to be a homogeneous imperfectly conducting sphere of radius a surrounded by infinite homogeneous dielectric. The transmitter is a Hertzian oscillator at distance b(>a) from the centre of the sphere with its axis, taken as the axis of harmonics, radial to the sphere. The oscillator emits simple harmonic waves of period $2\pi/\omega$, and the electric and magnetic forces are the real parts of the vectors $Ee^{i\omega t}$, $He^{i\omega t}$, E and H being related by the equation $\beta E = \text{curl } H$, $\gamma H = -\text{curl } E$, where β and γ are constants of the transmitting medium. The problem is then the purely mathematical one of the approximate summation of a complicated oscillatory series. Poincaré (1910) and Nicholson (1910) replaced the series by an integral which was then approximately evaluated by the calculus of residues. These approximations, however, became invalid near the antipodes of the transmitter, and the author considers their analysis defective in some points of detail. Macdonald (1914) approximates to the terms of the series and then replaces the modified series by an integral under conditions not strictly justifiable mathematically, and, moreover, uses an approximation not valid to the extent assumed, which is the principal source of the discrepancy between his results and those of Poincaré and Nicholson. March (1912) and Rybczynski (1913), in dealing with an oscillation on the positive half of the axis of harmonics, express a Hertzian function by an integral of $P_s(\cos\theta)$, whereas in dealing with harmonics of non-integral degree, the appropriate function is $P_s(-\cos\theta)$. This, as Love has pointed out in a directly arithmetical treatment of the problem (1915), vitiates the whole of their analysis, the expression assumed for the magnetic force having a line of singularities along the negative half of the axis of harmonics. The present author starts with a Hertzian function identical with that of Love in the case of an oscillator surrounded by infinite homogeneous dielectric, and identical also, except for a formal factor, with that of March. Avoiding the error pointed out by Love, the series for the magnetic force is derived from the Hertzian function, and is then transformed by the calculus of residues into a rapidly convergent series well adapted to numerical computation. Poincaré's analysis leads only to an approximation to the dominant terms of the latter series, but the more powerful contour integrals of the present paper give the complete series. The use of the Hertzian function and Bessel function of the types employed by March, makes the analysis remarkably concise. The expression obtained for the magnetic force at the antipodes of the transmitter shows that the effect of the waves which pass through the earth is trivial compared with that of those which traverse the atmosphere. (a-3, b-1, c-1, d-5, e-0, f-Theory)

135. ZEHNDER, L., "Horizontal Antennae of Reduced Length," Elektrot. Zeits., vol. 39, pp. 515-516; 26 December 1918. ABSTRACT: This communication, although sent in for publication before the outbreak of the war, has been kept back for military reasons and only recently released. Certain disadvantages possessed by the Marconi type of horizontal antenna are first pointed out. These are (1) that the horizontal antenna effect is only obtained when the vertical portion is short as compared with the horizontal portion. But the nearer the horizontal conductor is brought to the earth, the greater is the earth capacity effect, and in this way the sharpness of resonance is reduced. (2) That for the mid-point (centre of distributed capacity) to be 1/4 wave-length from the knee of the antenna the total length of the aerial must be 1/2λ. These conclusions have been confirmed as a result of tests made at Eberswalde station of the C. Lorenz Co. The author proposes to ob-

viate the drawbacks by concentrating the entire antenna capacity at the geometric mid-point M. In practice this cannot be done by putting the capacity at M and dispensing with the other half of the horizontal wire, since the two earthing points must be 1/2λ apart. If, however, things be so arranged that a potential loop be located at M, instead of a current loop, the antenna can be shortened to practically 1/4λ. This can be attained by bringing the antenna-end capacity up to the required amount by making it a counterpoise, or else by making it into an earth condenser by the insertion of a plate of dielectric between the end of the antenna and the earth (German Pat. 268,969; expired). In such case the earthing points are distant 1/4λ from one another. Since the refractivity of the earth's crust is about 2.5, the propagation velocity of the electric waves is only 2/5 of that in free air; the wave-length ratio is consequently only 2/5 of that in air. Hence the length of the modified horizontal antenna need only be 1/10 of the wave-length in air of the electric waves employed. Experiments have confirmed this, the signals from Clifden (6000 m) being received most loudly when the modified horizontal antenna had a length of 600 m. The modified arrangement can also be applied to purely horizontal antennae, and in such case an ordinary vertical or an umbrella antenna or a T-antenna can be used at the same station, and the apparatus housed in the same building, without the transmission from the one antenna interfering with the reception on the other. It is finally pointed out that owing to the high refractivity of water (n = 9), were a ship provided with a horizontal antenna 200 m long, with an earth condenser fore and aft, a natural frequency of 3600 m would be obtained. If, further, such a horizontal antenna were directly earthed at one end of the ship and at the other end provided with a counterpoise or an earth condenser, it would be suitable for use with waves of twice this length. (a-3, b-1, c-4, d-4, e-0, f-Theory and experiment)

1919

136. ADCOCK, F., British Patent Specification No. 130490; 1919. ABSTRACT: Referred to as the British patent for the Adcock antenna. (a-4, b-8, c-1, d-5, e-0, f-Referred to by Crampton in 1947: see Abstract No. 2766)

137. ECCLES, W. H., Maps for Radio Telegraphy and Aeronautics, Yearbook of W.-T.; 1919. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

138. HENRY, W. J., "The Priess Loop," Radio Amateur News, vol. 1, p. 270; 1919. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

139. PLETTS, J. T. V., "Wireless Maps," Wireless World, vol. 7, p. 68; 1919. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

140. BURSTYN, W., "The Radiating Power and Dirigibility of Some Antennae," Jahrb. d. Drahtl., vol. 13, pp. 362-378; January 1919. ABSTRACT: The dirigibility of some forms of directive aerials is studied following the method of the "form-factor," which is considered as being a function of the direction. The aerials are considered as composed of "dipoles" or are divided into a sufficient number of elements, in each of which the current can be considered as constant, and therefore each of them as a dipole. This latter case is that of the single-wire antenna of a flying aeroplane, which antenna assumes the shape of an S approximately. The energy radiated by directive aerials in all the directions of space (and not only in the horizontal plane) is considered. The results are in accordance with those already known. The radiating powers are calculated starting from the radiating power of a dipole. (a-3, b-1, c-4, d-4, e-0, f-Theory)

141. BURSTYN, W., "The Loop as a Receiver," Jahrb. d. Draht, vol. 13, p. 378; January 1919. ABSTRACT: Following the method already adopted in a former article dealing with the Marconi antenna, the author studies the dependence of the intensity of reception upon the sharpness of tuning, the dimensions of the loop and the wave-length, both for the case of undamped and damped oscillations. In both cases the intensity of reception is within wide limits, independent of the sharpness of tuning and, for small loops, is about proportional to the third power of the linear dimensions of the frame. The intensity of reception for undamped waves diminishes, however, more rapidly than in a Marconi antenna when the wave-length increases, whilst for damped waves an optimum wave-length is demonstrated to exist, the value of which depend upon the damping of the loop. (a-3, b-1, c-4, d-4, e-0, f-Theory)

142. BLATTERMAN, A. S., "Radio Direction Finding Apparatus," Elect. World, vol. 73, pp. 464-467; March 1919. ABSTRACT: An early article describing a method of D/F using the loop antenna. (a-6, b-2, c-1, d-5, e-0, f-Qualitative description)

143. WEAGANT, R. A., "Reception through Static and Interference," Proc. IRE, vol. 7, pp. 207-256; June 1919. ABSTRACT: A short discussion of long-wave static disturbances together with circuits found to help materially in reduction of static. Experimental data included. (a-6, b-1, c-1, d-1, e-0, f-Experimental study)

144. AUSTIN, L. W., "Quantitative Experiments with Coil Antenna," Journ. Wash. Acad. Sc., vol. 9, pp. 335-339; 19 June 1919. ABSTRACT: Formulae are derived for the current received in the cases (a) Coil sending and antenna receiving; (b) Antenna sending and coil receiving; and (c) Coil sending and coil receiving. The equations show that, other things being equal, if an antenna be used for both receiving and sending, the received current falls off as the first power of the wave-length, while if one coil be used, it falls off as the square of the wave-length, and with two coils as the cube of the wave-length. Signals from Arlington were measured at the U. S. Naval Radio Laboratory on two coils. One of these was a crossed coil direction-finder mounted on the roof of one of the buildings, having 56 closely wound turns, a height of 1.82 m and a length measured between the planes of the front and back vertical sections of 1.29 m. The second coil, supported from masts, had 7 turns 80 cm apart, and measured 21.6 × 24.4 m, θ (the angle between the plane of the coil and the direction of Arlington) being 42°. The results for reception on both coils show that the observed currents are always larger than the calculated values. This is supposed to be due to an action of the coil as an antenna, since an increase in the length of the leads increases the difference between the experimental and calculated current strengths. When the lower side of the coil is on or close to the ground, there is also an effect due to radio-frequency earth currents just as in the case of the ground antenna. The reason for the increased discrepancy for the shorter wave-lengths is not yet clear. The agreement of observed and calculated values in the case of the coil sending and Arlington antenna receiving is very close. A table is given of the effective heights of antennae which are equivalent, either for sending or receiving, to coils of various area turns. (a-3, b-1, c-1, d-1, e-0, f-Experiment and theory)

145. NIEMANN, E., "Aircraft Wireless Telegraphy," Jahrb. d. Drahtl., Tele. 14, pp. 69-89; May, and pp. 190-206; July 1919. ABSTRACT: This paper gives a detailed description, with numerous diagrams and photographs, of the wireless equipment of German aeroplanes. Illustrations are given of the various types of trailing and fixed antennae employed, and the characteristics of these (as regards directional transmission) are discussed. Full particulars of the valve transmitters and receivers are given, with circuit diagrams. (a-3, b-1, c-4, d-4, e-0, f-Equipment description)

146. ABRAHAM, M., "Radiation from Antenna Systems," Jahrb. d. Drahtl., Tele. 14, pp. 146-152; July 1919. ABSTRACT: A theoretical treatment of the radiation characteristics of two antennae at a definite distance apart. Special attention is given to the case where only one of the antennae is excited by the transmitting apparatus, the auxiliary antenna being in tune with and excited by the field of the first antenna. (a-3, b-1, c-4, d-4, e-0, f-Theory)

147. TAYLOR, A. HOYT, "Variation in Direction of Propagation of Long Electromagnetic Waves," Scientific Papers of the Bureau of Standards, vol. 15, no. 353, pp. 419-433; 1919/20. The date appearing at the conclusion of the paper is July 15, 1919. ABSTRACT: Discusses a method of compensating for antenna effect and other extraneous pickup. Results are given of a series of observations made on direction of arrival at Washington, D. C. of waves from transmitters at Annapolis, Md. and New Brunswick, N. J. Variations in direction of arrival up to 90° were noted and explained on the basis of addition of diffracted and reflected components to the direct component of the wave. (a-6, b-1, c-1, d-1, e-0, f-Experimental investigation)

148. ABRAHAM, M., "A Comparison of Coils and Open Antennas for Reception," Jahrb. d. Drahtl., vol. 14, pp. 259-269; August 1919. See also Radio Rev., vol. 1, pp. 147-148; December 1919. ABSTRACT: The author investigates the amount of energy that a coil or antenna can abstract from the radio wave, and their relative susceptibility to atmospheric disturbances. The original is analytical, and the abstract contains expressions for the more important results. (a-6, b-1, c-4, d-4, e-0, f-Theory)

149. WHITTEMORE, L. E. AND BREIT, G., "Inductance, Capacity, and Resistance of Coils at Radio Frequencies," Phys. Rev., vol. 14, pp. 170-172; August 1919. Abstract of paper read before the Am. Phys. Soc.; April 1919. ABSTRACT: The inductance coil used in a radio circuit may usually be considered as a pure inductance shunted by a capacity representing the distributed capacity of the coil. The pure inductance can most conveniently be determined from the values of the apparent inductance as obtained from the capacity which is required to give resonance at certain frequencies. The apparent inductance is very large at wave-lengths which are near the natural wave-length of the coil, decreasing as the wave-length is increased, until a very long wave-length is reached at which the inductance increases again slightly due to the absence of skin-effect. (a-3, b-1, c-1, d-1, e-0, f-Theory)

150. TAYLOR, A. H., "Short Wave Reception and Transmission on Ground Wires," IRE, vol. 7, pp. 337-361; August 1919. ABSTRACT: After a historical review of the work of the U. S. Navy with underground and under-water receiving systems, the author gives data demonstrating the possibility of effective reception on such systems, particularly when using amplifiers. These systems are found to be directional toward waves traveling parallel to the length of the wire pair. This directional selectivity, which is marked, is applied in control stations for duplex working. For such underground systems, an optimum wire length for best reception is roughly proportional to the wave-length and independent of the direction of approach of the signal. This length is independent of the nature of the surrounding medium and varies inversely as the capacity per unit length of the wire. The wire in question must be well insulated. Reception through violent storms is attainable, and also suppression of summer strays (particularly at short wave-lengths). The lowering of such wire systems from above ground into wet soil or into water greatly increases the signal and diminishes strays. Transmission at short wave-lengths, over considerable distances, using such systems, has been possible with low-power sustained-wave transmitters. (a-3, b-1, c-1, d-1, e-0, f-Experimental investigation)

151. WILLOUGHBY, J. A. AND LOWELL, P. D., "Development of Loop Aerial for Submarine Radio-Communication," Phys. Review, vol. 14, pp. 193-194; August 1919. ABSTRACT: The loop aerial as finally perfected consisted of two insulated wires earthed at the extreme ends of the hull of the submarine carried over suitable supports to the bridge and hence through radio lead-ins to the receiving and transmitting apparatus. Experiments showed that communication at sea could be carried on under all conditions more efficiently with such a loop than with the ordinary antenna. The maximum depth of submergence at which signals can be received is determined by the wave-lengtl . For short wave-lengths, the top of the loop must be near the surface of the water, whereas a frequency of 30 kc can be received when the top of the loop is submerged 21 ft. Signals can be transmitted from the loop, using a 952 m wave-length, to a distance of 10 or 12 miles when the top of the loop is practically at the surface. The range decreases to 2 or 3 miles when the top of the loop is 8 or 9 ft below the surface. The loop can also be used as a direction-finder, maximum signals being obtained when the submarine is pointing toward the station. (a-3, b-1, c-1, d-1, e-0, f-Experimental investigation)

152. BLATTERMAN, A. S., "Theory and Practical Attainments in the Design and Use of Radio Direction-Finding Apparatus Using Closed-Coil Antennas," Journal Frank. Inst., vol. 188, pp. 289-362; September 1919. ABSTRACT: The paper summarizes an investigation that was carried out in the U. S. Signal Corps Radio Labo atories during 1917-1918 on all the factors that enter into the effic.ent design of D/F's with loop antennas. Subjects considered include: general theory of the induced voltage method of measuring loop efficiency; determination of best spacing, and effect of size and kind of wire; determination of best size of loop and number of turns for a given wave-length; design charts; effect of deviation from best wave-length. Part two of this report gives the theory of the directional characteristics of loop antennas with a study of antenna effect. (a-6, b-1, c-1, d-1, e-0, f-Experimental and theoretical analysis)

153. VAN DER POL, B., "On the Propagation of Electromagnetic Waves round the Earth," Phil. Mag., vol. 38, pp. 365-380; Sept. 1919. ABSTRACT NO. 1: A theoretical investigation of the propagation of electromagnetic waves around a conducting sphere, based on diffraction theory. ABSTRACT NO. 2: In this paper, written before the communication of Watson's last paper, the author seeks means of comparing the amplitudes of radiotelegraphic waves to be expe ted on the diffraction theory, with the observed normal values. The laytime measurements, being usually more steady than those obtained during darkness, are taken as normal. A critical analytical examination of the results of Nicholson, Love, Macdonald, after correcting an oversight in writing $d/d\theta$ for $d/d\mu$ in his analysis, and Watson, leads to the conclusion that, in the light of the summation by Watson in this paper of the rapidly alternating harmonic series for the amplitude of the magnetic force, they are all in agreement within the limits of their validity as determined by Watson's analysis. All three investigations, moreover, lead to the conclusion that a finite conductivity of the order of that of sea-water, has only a small influence on the wave-amplitude, increasing it a few percent in comparison with the case of infinite conductivity. And Watson obtains a similar result for the conductivity of dry earth. Austin's observations give amplitudes of as much as two million times the values to be expected from diffraction, and in the author's opinion strongly support the Eccles theory of ionic refraction. With reference to Watson's result that with the assumption of a sharp inner boundary to what Eccles terms the "Heaviside layer" values of the field are obtainable of the order of magnitude of the observations, the author remarks that "roughly speaking" the ionic refraction will amount to the same as if a layer were present in the higher atmosphere which is more or less impermeable to long electric waves, and this may account for the interpretation adopted by some writers, e.g., Watson in his latest paper, of a reflection by a layer of high conductivity. Whether the interpretations in terms of reflection or refraction would differ appreciably will obviously depend on the vertical density gradient of the ions in the upper atmosphere. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Theoretical analysis)

154. MESNY, R., "Memorandum on the Compensation of Loops," Navy Report RE 3A 192; September 1919. ABSTRACT: A lengthy con-.ideration of loop direction finders in the presence of elliptically polarized fields. (a-5, b-3, c-1, d-1, e-0, f-0)

155. BELLINI, E., "An Electrostatic Direction Finder," Electrician, vol. 83, pp. 273-275; September 1919. ABSTRACT: There are two practical means for coupling two or more oscillating circuits, namely, by magnetic and by electrostatic coupling. The Bellini-Tosi radiogoniometer utilises the magnetic coupling between the fixed aerials and the apparatus for detecting or generating the oscillations. The electrostatic apparatus described in the present article utilises electrostatic coupling. It can assume two different forms. The first form is constituted as a special multicellular Kelvin electrometer, by four systems of fixed plates (in the case of two perpendicular directive aerials) connected to the directive aerials through the tuning devices and by a couple of movable plates of special form, subjected to the influence of the fixed plates (or influencing them) and conveniently connected to the detector and telephone or to the oscillation-generating devices. The system of fixed metallic plates forms a kind of ring (or several equal superposed rings) of external and internal radius R and r, each plate, or system of plates, being separated from the adjacent ones by the angular widths ϵ. One part of the fixed plates is connected to a directive aerial, practically a frame, the width of which is supposed to be so small in comparison of the wave-length of the impinging (or radiated) waves that the amplitude of the emf generated in it (or the intensity of the electromagnetic field generated in the space) can be assumed to vary according to cos ϕ, where ϕ represents the angle that the direction of the sending station (or that of the receiving station) forms with the plane of the aerial. The second couple of plates is similarly connected to an identical aerial, orientated 90 deg from the first aerial. The movable plates are of special shape, the equation of the line limiting these plates being $\rho = \sqrt{[(\rho_0^2 - r^2)\cos\psi + r^2]}$, $\cos\psi$ being always taken with the positive sign and ρ_0 being smaller than R. The said equation really represents a single plate, but a saw-cut divides it into two single halves, electrically insulated one from another. The theory shows that, in the case of reception, the current intensity through the detector has the form $i = k(\rho_0^2 - r^2)(\cos\frac{\epsilon}{2} - \sin\frac{\epsilon}{2}) \times \cos(\phi - \beta)\sin\omega t$; it varies, consequently, according to $\cos(\phi - \beta)$, exactly as the current through the exploring coil of the magnetic radiogoniometer. The second form of the electrostatic radiogoniometer is then described and some diagrams of connections given. (a-3, b-1, c-1, d-5, e-0, f-Theoretical analysis)

156. BLONDEL, A., "On the Goniometric Functions Applicable to Directive Aerials," Radio Rev., vol. 1, pp. 1-10, 58-66, 110-123. See also correspondence by Brady and Packard, same issue, pp. 256-257; October, November, December, February 1919-1920. ABSTRACT: Paper on what the author terms "goniometric functions" of two basic directional antennas. These are grouped open-antenna systems connected so as to be additive or differential. The variation of the emf in the directive aerials employed for reception in wireless telegraphy; the methods by which they can be used for determining the direction of the incoming waves; the exactitude of the bearin. s so obtained; and the application of said aerials to the service of radiophares; all these are treated in this article. Two types of directive aerials are considered - (a) the ordinary type, which is usually in loop form; (b) the aerial constituted by two vertical grounded antennae connected to the detector so that this gives the loudest sound when the plane of the antennae is at right angles to the

direction of propagation of the waves. The first aerial is preferable to the second from all points of view. The law according to which the emf in the directive aerials varies with the angle which the incoming waves form with the aerial, is called the "goniometric function" and is amply illustrated. The zero method of determining the bearings is demonstrated to be preferable to the comparison method, which consists in comparing the intensities of the sounds obtained from two or more fixed loop aerials set at known angles to one another. The effect of the wave-decrement is particularly considered and it is demonstrated that it gives rise to a difference between the amplitudes of the emf's in the two halves of a directive aerial, which difference increases with the ratio of the aerial width to the wave-length. The error produced by the wave damping upon the bearings is rigorously zero when these are taken with a simple rotating loop. But when a radio-goniometer is used, the wave damping produces an error in the bearing; in all practical cases, however, this error is negligible. The wave-damping produces also a phase-shifting of the current, which is altogether of no sensible influence in practice. With a view to diminishing all possible errors, now that extremely sensitive amplifiers are available, the author intends to increase to 1000 m the wave-length of the "radiophares"; the wave-length of these was fixed at 150 m by the London Radiotelegraphic Conference of 1912. As for the phenomena arising from the reflection of the waves by metallic surfaces, the experiments of Mesny have revealed the remarkable fact that they give rise to systematic quadrantal errors of the same type as the usual magnetic errors found with the magnetic compass; in consequence, the correction curve can be determined once for all for each vessel. Many curves and diagrams illustrate the article. (a-3, b-1, c-1, d-5, e-0, f-Theoretical analysis)

157. KEEN, R., "How Aeroplanes Are Navigated by Wireless," Wireless World, vol. 7, no. 79, pp. 389-393; October 1919. ABSTRACT: Operation of wireless direction-finder. (a-3, b-1, c-1, d-5, e-0, f-Description)

158. DELLINGER, J. H., "Radio Transmission and Reception with Antenna and Coil Aerials," AIEE, vol. 38, p 1095; October 1919. ABSTRACT: The advantages of the coil aerial as a direction finder, interference preventer, reducer of strays, and submarine aerial make it important to know how effective the coil aerial is, in comparison with the ordinary antenna, as a transmitting and receiving device. In the present paper simple formulae are worked out from fundamental electromagnetic theory, by which the performance of any aerial can be calculated. Experiments have verified the formulae, and show that they are a valuable aid in the choice and design of an aerial to fit any particular requirements. The principal formulae are of three kinds: (1) theoretical formulae giving the magnetic field intensity at any distance from either kind of aerial, and the current produced by a given field intensity in either kind of aerial; (2) comparison formulae, giving the ratio of performance of antenna and coil aerials under various conditions; and (3) transmission formulae, giving the current in any receiving aerial in terms of the current in the distant transmitting aerial. The theory and nature of radiation are discussed, and applied to the elucidation of some current fallacies. The distinction between induction fields and radiation fields is presented. It is shown that the receiving action in any kind of aerial may be considered as arising either from the electrostatic or the magnetic field present in the wave. Such questions are discussed as the distinction between "open" and "closed" circuits. It is shown that a metallically closed circuit can radiate, and that radiation takes place at all frequencies, the amount of radiation being greater the higher the frequency. The ratio of the range of communication obtainable with a coil aerial to that with an antenna is proportional to the number of turns and horizontal length of the coil, and inversely proportional to the wave-length. The coil aerial is hence particularly suited to communication on short wave-lengths. A coil aerial is quantitatively as powerful as an antenna only when its dimensions approach those of the antenna. However, it is easy to make the resistance of a coil aerial circuit much smaller than the resistance of the ordinary antenna circuit, and thus make a small coil as effective as a large antenna. A small aerial as effective as the ordinary antenna may be secured without recourse to the coil principle by using as aerial a condenser having two large parallel plates, arranged so that the dielectric of the condenser includes no ground. The circuit of such an aerial may be made to have a very low resistance. It appears likely that, with the use of either condenser or coil aerials, together with sensitive amplifiers, radio aerials will in future be much smaller than hitherto. These principles apply with particular advantage to aeroplane aerials. A coil aerial usually functions by a combination of the pure coil action and antenna action. The latter arises from the stray capacities and capacities to earth which are inevitably present. The existence of these capacities may be shown by differences in ammeter readings at different points of the circuit. The antenna effect makes the actual received current in experiments with coil aerials larger than the values calculated from the transmission formulae. The observed values are also affected by the currents in neighbouring objects. A formula for the radiation resistance of coil aerials is worked out. Comparison of experiment with this formula supplies additional evidence that the coil operates by a combination of antenna and coil effects. The fundamental principles of design of aerials are given. On the basis of this work the actual functioning of any type of radiotelegraphic aerial can be determined either from measurements made upon the aerials or from actual transmission experiments. (a-3, b-1, c-1, d-1, 3-0, f-Theory)

159. ANONYMOUS, "Direction Finding by Wireless Telegraphy," Engineering, vol. 128, no. 3329, pp. 388-391; 17 October 1919. ABSTRACT: Principal features of wireless D/F and methods of its application to navigation at night and under adverse weather conditions. (a-3, b-1, c-1, d-1, e-0, f-Description)

160. SANKEY, H. R., "Wireless Direction Finders," Engineering, vol. 108, no. 2807, pp. 523-524; 17 October 1919. ABSTRACT: Apparatus developed by British army during war. (a-3, b-1, c-1, d-1, e-0, f-Description)

161. SANKEY, H. R., "Wireless Direction Finders," Engineering, vol. 108, no. 2808, pp. 545-547; 24 October 1919. ABSTRACT: Apparatus in which aerials are fixed and readings are taken by rotating small handle. (a-3, b-1, c-1, d-1, e-0, f-Description)

162. WEYL, H., "Radiation of Electric Waves over a Plane Conductor," Ann. d. Physik, vol. 60, no. 5, pp. 481-500; 20 November 1919. ABSTRACT: Mathematical treatment of the mentioned subject. (a-4, b-1, c-4, d-4, e-0, f-Theory)

163. FESSENDEN, R. A., "The Fessenden Pelorus: Wireless Compass," Electrician, vol. 83, pp. 719-721; 19 December 1919. ABSTRACT: The author considers that the wireless compass should rather be designated a "Pelorus," for the reason that it gives the direction of the source of electromagnetic waves relative to the lubber-line of the ship and has no relation whatever to the points of the compass. He claims that the rotating coil was invented by him in 1899 and the radial arrangement of a number of directive aerials connected to a commutator was patented by him in 1907. It was found, however, that in some cases errors as high as 20° or 45° were obtained. The author discovered that these errors were due to the varying local conductivity of the ground and of the vegetation, to the difference between the conductivity of sea-water and that of the coast, and to the presence of large bodies of ionised air. These causes produce a bending of the electromagnetic rays, and the author found that the amount of bending is a function of the wave-length. To deal therefore with this bending he sets forth to employ two or three different wave-lengths; the use of these allows the existence of an error to be detected and the amount of the error to be estimated by the aid of formulae which will be given in a later paper. A set of readings taken between two U. S. stations for every hour of the day and night for a complete week shows that the errors are mainly in the direction of the shore side; but the errors in the other direction while fewer in number are occasionally much larger in magnitude. A number of diagrams illustrate the article. (a-3, b-1, c-1, d-5, e-0, f-Description of experiments)

164. ANONYMOUS, "Kolster's Direction-Finder," Wireless Age, vol. 7, pp. 24-25; November 1919. ABSTRACT: This apparatus comprises two sets of rectangular coils of several turns, whose planes are at an angle with each other, usually 90°. A pointer or needle rotates with each set of coils over a graduated scale. The two coils of each set are connected in series with each other and with tuning condensers, which are connected to the outer terminals of a change-over switch. The centre of the switch is connected to a detector, preferably a multistage audion detector. With the switch to the left, the capacitor is turned to the energy transmitted from the station, and the left-hand pair of coils is then shifted to such a position that there is no response in the telephones, in which case the needle will point towards the station D. The switch is then turned to the right and the operation repeated. Since the distance between the centres of the two pairs of coils is known, the distance of D may be estimated with more or less accuracy. (a-3, b-2, c-1, d-0, e-0, f-A diagram is given in the original abstract)

165. MESNY, RÉNÉ, "Marine Radio-Goniometer (Radiogoniomètres de bord," Bulletin Technique du Bureau Veritas, vol. 1, nos. 6 and 7, pp. 93-95 and 114-118; November and December 1919. ABSTRACT: Principle of operation and installation. Precaution to avoid errors in measurements taken. (a-3, b-1, c-3, d-3, e-0, f-Description)

166. TAYLOR, A. HOYT, "Long Wave Reception and the Elimination of Strays on Ground Wires (Subterranean and Submarine)," Proc. IRE, vol. 7, pp. 559-583; December 1919. ABSTRACT: Ground-wires show positive indication of optimum length only in the case of the lead-covered cable lying on the surface. It is highly probable that an optimum length also exists where the wires are laid in dry soil, and it is quite possible than an optimum length exists for wires in fresh water, but wires in salt water show no indications whatever of optimum length. The optimum length, in any event, is much less sharply marked for long waves than for short ones. Multiplex reception is possible on the ground-wire, water wire, or surface cable, it being possible to receive any number of long-wave stations on different wave-lengths simultaneously so long as the local oscillations are adjusted in such a way that the sets do not heterodyne against each other within the range of audibility. Wires laid in fresh water or in dry ground show the same ratio of signal to stray as a large rectangle. Lead-covered cable is better than the rectangle, but the difference is not very great. The best results in this respect are obtained with wires laid in salt water; the next best with wires laid in wet earth. Wires in the earth have been laid as deep as 7 ft in dry ground without showing any diminution in signal strength; in fact the signal strength was greater than for wires buried 2 ft deep. Wires may be laid in fresh water up to 60 ft deep and still receive good signals, but in salt water the signals fall off rapidly with the depth, and for transatlantic work a depth of from 6 to 18 in. is preferable. Various methods for the elimination of strays are described. Two types of balanced circuits have been used in transatlantic work at Belmar. One of these depends upon the dissimilar properties of a land wire and a sea wire, and the other upon the dissimilar properties of a sea wire and a rectangle. The wiring of these arrangements is shown, the method of adjustment described, and experimental results are given. It is estimated that the improvement in readability obtained by the use of the balanced circuits is about 9 to 1. (a-3, b-1, c-1, d-1, e-0, f-Experiments)

167. FRANCK, P., "Wireless, Telegraphy and Aerial Navigation," Aeronautique, vol. 1, p. 291; December 1919. See also Radio Rev., vol. 1, p. 562; August 1920. ABSTRACT: The author explains the principles of D/F and makes recommendations for installation of D/F stations. (a-3, b-1, c-3, d-3, e-0, f-Theory)

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168. HOWE, G. W. O., "The Upper Atmosphere and Radio Telegraphy," Radio Rev., vol. 1, p. 381; 1920. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

169. HOWE, G. W. O., "The Relative Advantages of Elevated Antennae Loop Aerials and Underground Wires for the Reception of Wireless Signals," Radio Rev., vol. 1, p. 175; 1920. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

170. WRIGHT, G. M., Direction-Finding, Year Book of W.T., p. 946; 1920. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

171. PUNGS, L., "Directive Wireless Telegraphy in the German Navy," ETZ, vol. 41, p. 922; 1920. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

172. CHAPMAN, S., "Electrical Phenomena Occurring at High Levels in the Atmosphere," JIEE, vol. 57, p. 209; 1920. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

173. KEEN, R., "How Aeroplanes Are Navigated by Wireless," Wireless World, vol. 7, no. 82, pp. 578-582; January 1920. ABSTRACT: Description of installation of direction finder in standard type of aeroplane. (a-3, b-1, c-1, d-5, e-0, f-Description)

174. LIEUT, P., "Marine Wireless Direction Finding," Radioélect., vol. 1, p. 33; 1920. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

175. KEEN, R., "How Aeroplanes Are Navigated," Wireless World, vol. 7, no. 82, pp. 578-582; January 1920. ABSTRACT: Description of direction finder in standard type of aeroplanes. (a-3, b-1, c-1, d-5, e-0, f-Description)

176. BALDUS, R., BUCHWALD, E. AND HASE, R., "On the History of Direction-Finding at the Doberisty and Larz Aerodromes," Jahrb. d. Draht., vol. 15, p. 99; 1920. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Historical)

177. JOHNSON, T., JR., "Naval Aircraft Radio-Telegraphy," Proc. IRE, vol. 8, pp. 3-58 and pp. 87-134; February; Disc., 135-141; April 1920. ABSTRACT: The major part of this paper is taken up with a description of the various pieces of apparatus that have been developed by the U. S. Navy Department for use on aircraft, accompanied by excellent illustrations. In the second part an account is given of the types of wireless direction finder used on aeroplanes, flying boats, etc. The direction finder itself is of the directly movable frame aerial type, but is provided with an auxiliary winding at right angles to the main frame aerial. The method of use is similar to that known as the R.A.F. method, or Robinson's method, making use of the maximum signal in the same way. (a-3, b-1, c-1, d-1, e-0, f-Equipment description)

178. BUCHWALD, E., AND HASE, R., "Wireless Reception in Aeroplanes," Jahrb. d. Drahtl., Tele. 15, pp. 101-113; February 1920. ABSTRACT: Experiments by the authors on wireless reception in aeroplanes are described in this article. The transmitting station was a transportable military station with T-antenna supported by a mast 14.4 m high, of 250 m wave-length and with 3.5 amps in the antenna. The antenna of the aeroplane was an ordinary one. The observations in the aeroplane were made by the aid of a bolometer and of a direct-reading instrument of 2.7×10^{-7} amp sensitiveness. A photographic camera turned downwards allowed of photographs being taken of the ground at the instant the observations were made; these gave, consequently, the position of the aeroplane and the direction of its flight. To find the dependence of the intensity of reception upon the distance, the aeroplane was maintained at 500 m height and the direction of the flight was perpendicular to the line-sending station aeroplane, only the distance from the transmitting station being varied. The experiments, made at distances not greater than 4 km, showed that under these conditions the current intensity varies inversely as the square of the distance. But when the aeroplane flies towards or from the station the law of variation of the intensity of the received current was found to be quite different. The intensity of reception increases in the first case when the aeroplane flies towards the transmitting station, attains a maximum at about 800 m from this and diminishes afterwards. In another case (1000 m height) it was found that, after the maximum, the current quickly came to zero at about 300 m before reaching the station, presented a second maximum at about 500 m past the station, after which the current became nil at 2 km and remained very small at larger distances. The influence of the orientation of the aeroplane upon the intensity of reception was determined by letting the aeroplane cross the same point of the space in different directions (star flight). The observations were made at the distance of 2.8 km and at the height of 1000 m. The reception was very strongly directive. The polar diagram has about the form of a cardioid, the maximum taking place when the aeroplane points towards the sending station and there being two zeros at about 30° on either side of the opposite direction. The polar diagram is slightly asymmetric, which is attributed by the author both to the fact that the wind of the propeller pul' the aerial to one side and to the asymmetry of the aeroplane's metallic masses. (a-3, b-1, c-4, d-4, e-0, f-Experimental)

179. BUCHWALD, E., "Scheller's Wireless Route Indicator Applied to Aeroplanes," Jahrb. d. Drahtl., Tele. 15, pp. 114-122; February 1920. ABSTRACT: In 1907, Scheller took out a patent for a transmitting station, essentially consisting of two equal directive aerials pointing in different directions, alternately transmitting two complementary letters - for instance, a and n - so that in the direction of the bisectrices of the angles of the two aerials these letters are received with equal intensities, and thus form a continuous line, these two directions being sharply defined. In this way a ship keeping this direction could not fail to reach the transmitting station. During the war it was tried to apply Scheller's device to enable aeroplanes to find their way towards the transmitting stations: for this purpose two horizontal antennae were employed at the transmitting station. But the results obtained were so contrary to what was expected and so puzzling that no applications were possible. For instance, the letter "a" was received in certain directions where the letter "n" was expected to be received, and vice versa: when the aeroplane turned round half a turn the letter received sometimes remained unchanged, sometimes one was replaced by the other. In the present article the author explains the results of the experiments by a theory, put forward by Burstyn, which considers the sending antennae as simple oscillators, neglect the presence of the earth and takes into account the angle that the line aeroplane-transmitting station forms with the horizontal plane, the angle of the horizontal projection of such line with the axis of the aeroplane, and the inclination to the horizon of the aeroplane antenna. This theory

shows that the results are independent of the angle between the two transmitting antennae, but are greatly influenced by the other angles. The experiments showed that when the aeroplane flies towards or from the transmitting station, the letter received is the same as that received on the earth's surface (earth letters). When the aeroplane turns round the transmitting station, clockwise or counter-clockwise, the letters received are just the opposite of the earth letters and the directions of passage from one letter to the other are reached before the bisectrices of the angles of the antennae, the leading angle being larger the higher the aeroplane is, but not exceeding 11°. When the aeroplane crosses the same point of space under different directions (star-flight), earth letters are received when it points towards or from the transmitting station, but counter-earth letters are generally received at right angles to the said directions. Diagrams of flights actually accomplished and of observations made are given and show a general good agreement with the theory, except for low flights, such discordance being ascribed by the author to the presence of the earth, which is not taken into account by the theory. (a-3, b-1, c-4, d-4, e-0, f-Theory)

180. LITTLEHALES, G. W., "The Prospective Utilization of Vessel-to-Shore Radio-Compass Bearings in Aerial and Transoceanic Navigation," Jl. Am. Soc. Naval Engrs., vol. 32, no. 1, pp. 38-44; February 1920. ABSTRACT: Method is described for finding altitude and longitude in aerial and marine navigation from vessel-to-shore radio-compass bearings, and theory is explained upon which such method is based. (a-3, b-1, c-1, d-1, e-0, f-Description)

181. ROUND, H. J., "Direction and Position Finding," JIEE, vol. 58, pp. 224-247; March 1920. See also Disc., pp. 247-257; March 1920; Engineering, 109, pp. 108-112; 23 Jan., and pp. 161-164; 30 Jan. 1920: El. Rev. 86, pp. 185-187; 6 Feb., and pp. 220-221; 13 Feb. 1920: Electrician, 84, pp. 317-319; 1920. ABSTRACT: A sketch of the war development of wireless direction and position finding is the subject of this paper. After a short résumé of the principles underlying directional reception, of the apparatus employed for this purpose, of the effect of the earth, etc., the author describes the zero method of taking bearings with a single loop. The method consists in employing two rigidly connected rotating coils, equal and at right angles to one another, and in turning them till equality of reception strength is obtained when manoeuvring a change-over key to change from the one coil to the other. This method was used on aeroplanes by the Royal Air Force. The Bellini-Tosi radiogoniometer was largely used. At the beginning a great divergence between the observed and the true directions was found. Nearly all the errors were put down to two causes: (1) an electric coupling between the two aerial systems, which difficulty was overcome by setting out the aerial systems accurately; (2) an incorrect turning and consequent mis-phasing of the two aerial systems; this drawback was overcome by separately tuning each aerial by means of a small buzzer transmitting radiogoniometer coupled to the aerial systems. The use of aluminium-vane condensers having air as dielectric gave trouble, because it was found practically impossible to avoid resistance at the contact to the aluminium vanes. This type of condenser was therefore replaced by condensers with brass vanes, solidly soldered up. Aerial systems used in connection with the radiogoniometer were either small diamond-shaped frames supported on 70-ft wooden masts, or rectangular frames supported on four masts. The latter form seems to be the best for general all-round accuracy, but, on account of the cost of masts, the first type was more generally used. A few dimensions of the frames used for different wave-lengths are given in the paper. Two types of radiogoniometers were used, called "tight coupled" and "loose coupled," which differed in the dimensions of the search-coil. Actually, both types were tight-coupled, which was found useful for having a reasonably wide range of wave-lengths without touching the aerial tuning, which is a delicate operation. Thus, for instance, when aerials were tuned to, say, 800 m; by only returning the intermediate and final circuits, signals could be received with only a slight falling off in strength from 600 to 1000 m. Valves and amplifiers were used with the radiogoniometer as soon as they were at hand. From the technical point of view, soft valves were found preferable to hard tubes for direction-finding work, but as their manufacture and their efficient use necessitated trained men, they were replaced by hard valves. Characteristic curves of a soft valve type "C," is shown, as well as diagrams of connections to the radiogoniometer. The "vertical error" of frames was corrected by methods chiefly consisting in shielding and shunting to earth. A review of night and daylight errors and effects is reported by the author. In England and France errors on swing readings on spark stations are present up to 7° at night and seldom more, whilst in the East errors were much greater than this: for instance, at Salonica the Sofia station would sometimes shift through 90°. Continuous waves give much greater variations than spark stations. The error is a function of the wave-length. When signals come oversea from moderate distances, and practically no land intervenes, results are then the most reliable, and can be relied upon for the greater part of the time. The minimum distance at which night effects have been noticed in England or France is about 15 miles. The bearings of some stations never vary seriously: for instance, in England, the stations Malta, Hanover, etc., are practically constant. Aeroplanes gave much trouble. An aeroplane flying towards or away from a station gives no error. In other cases the error is positive or negative according to the sense of flying. Much trouble was experienced in the reception of short waves, as used by German submarines, with the radiogoniometer before the cascade amplifier came into its own. Before this epoch short-wave work was made with rotating frames. Only just as the war was finishing was it possible to tackle waves under 200 m satisfactorily on the Bellini-Tosi system. Aperiodic radiogoniometers were suggested by G. M. Wright in order to overcome the difficulty of a rapid searching over long ranges of wave-lengths. These were obtained by short-circuiting the aerial condensers and by closer coupling of the search coil with the aerial coils. To avoid the "vertical error" which becomes very important in this case, the mid-points of the two fixed coils were earthed. After some trials it was found that the self-heterodyne circuits were the most suited to the purpose. This apparatus remained the standard continuous-wave apparatus during the remainder of the war. Many details about the valves and cascade amplifiers are given. In particular, by using special high-resistance wire for intervalve windings, a set of 11 valves was made of approximately equal sensitiveness from 250 m to 10,000 m wave-length. An interesting side-line on direction-finding work was that sometimes the positions of thunderstorms could be approximately determined and checked, and that X's exhibited very frequently in England a sharp direction at about 165° E. of N., a direction near that of the magnetic meridian. Radiogoniometers on board ship showed the known phenomenon of readings crowding towards the axis of the ship. Diagrams of errors found on H.M.S. Warspite are given. A few details concerning the installation of the radiogoniometer on aeroplanes, and particularly upon the four-engined Handley-Page, which went to Newfoundland, are given. The Ditcham arrangement for prevention of jamming, utilising the valve characteristics, is described in an appendix. (a-3, b-1, c-1, d-5, e-0, f-Theory and experiment)

182. ROBINSON, J., "A Method of Direction-Finding of Wireless Waves," Radio Rev., vol. 1, pp. 213-219, February 1920; pp. 265-275, March 1920. ABSTRACT NO. 1: Describes the Robinson D/F using a cardioid pattern for sense and bearing, with either a rotating loop or Bellini-Tosi loops. ABSTRACT NO. 2: The single rotating loop and the Bellini-Tosi methods of determining the direction of the incoming waves are zero methods; they are, therefore, not convenient on aeroplanes because of the noise of the engine and of the wind. The method described is a maximum method, and is consequently free from the inconvenience above mentioned. It is realised by using two loops at right angles, the main loop having a number of turns 2 or 3 times less than the auxiliary one. The two loops are series-connected, and a change-over switch allows the connections of the auxiliary coil to be inverted. When the main coil is exactly in the plane of propagation of the waves, the emf in the auxiliary coil is zero, and the switching-over of it has therefore no influence upon the intensity of the signals. The sensitiveness of the method depends upon the ratio of the number of turns of the auxiliary to that of the main coil. For this reason the auxiliary coil has more turns than the main coil. Two ways of applying the new method to aircraft are described. In the first the two coils are fixed to the wings of the aeroplane, which must therefore alter its course in order to find the direction required. The second consists in installing on the aeroplane a couple of coils, which can be rotated around a vertical axis. The first method gives larger intensity of signals and no errors. The second method gives quadrantal errors, but no errors in the fore-aft and athwartships directions. The quadrantal errors, which can be as large as 8° or 9°, are independent of the wave-length, so far as observations have gone, using waves from 2000 to 8000 m. Directions for designing coils for any wave-length are given. (a_1-6, a_2-3, b-1, c-5, e-0, f-Theoretical analysis)

183. SMITH, F. E., Correspondence on "A Method of Direction-Finding of Wireless Waves," Radio Rev., vol. 1, p. 415; 1920. ABSTRACT: Refers to Abstract No. 182. (a-4, b-1, c-1, d-5, e-0, f-Theory)

184. HOLLINGWORTH, J., Correspondence on "A Method of Direction-Finding of Wireless Waves," Radio Rev., vol. 2, p. 56; 1920. ABSTRACT: Refers to Abstract No. 182. (a-4, b-1, c-1, d-5, e-0, f-Theory)

185. BALDUS, R., AND BUCHWALD, E., "Experiments on the Wireless Direction-Finding of Aeroplanes," Jahrb. d. Draht., vol. 15, p. 214; 1920. ABSTRACT: The aeroplanes were provided with quenched spark sending apparatus; the antenna consisted of a simple cable, 0.40 m long, loaded with a weight. When flying, the first part of the antenna, about 18 m, was practically rectilinear and inclined

almost 20° to the horizon; the rest of the antenna was more and more curved towards the earth. The counterpoise was constituted by the motor and the metallic parts of the aeroplane. Different types of aeroplanes gave the same results. The position of the aeroplane at the moment of the measurements was obtained by taking photographs of the land by a camera carried by the aeroplane and turned downwards; its height was given by barometric observations. Three land stations were used in turn for experiments. They were provided with two crossed directive aerials and a radiogoniometer of Bellini-Tosi type. The aerials, of triangular shape, were not closed at the top, but were provided with vertical wires descending from the tops and entering the station. These wires could be left open, or be short-circuited, or condensers of 240 cm capacity could be inserted between them. The experiments were chiefly made with open antennae. The wave-lengths used were 150, 200, or 250 m. Trapezoidal aerials were also used and gave the same results as the triangular ones. The direction of the aeroplane given by the D/F station depends upon the angle that the axis of the aeroplane forms with the horizontal projection of the line: sending station-aeroplane. The error is zero when this angle is 0° or 180°, namely, when the aeroplane points towards or from the D/F station. The errors become larger when this angle approaches 90°. The errors can be as high as 50° or 60° and are such that the wireless directions are always shifted towards the tail of the aeroplane. These experiments were made by the so-called star-flight, i.e., letting the aeroplane cross, in different directions, the vertical from the same point of the earth. The errors were found to vary with the day and, still more, according to the land station. For a station 1 km distant from another the errors were reduced to half or one-third. The errors increase when the distance diminishes or the height increases; they depend upon the ratio of these two quantities, namely, upon the angle that the straight line: aeroplane-D/F station forms with its horizontal projection. For a value of such an angle of 18° the error can be as large as 60°. These results were obtained by zigzag flight (meandering flight). Closed aerials give less errors than open aerials; with the former the errors are 1/3 to 1/4 of those with the latter. The Burstyn formula for calculating the errors gives too small errors when using open antennae and too large errors when using closed antennae. The errors increase when the wave-length increases. The angle that the straight line: aeroplane-D/F station forms with the vertical N.-S. plane is of influence upon the errors. These are minimum when the aeroplane is in the planes of the aerials and maximum when in the directions of the bisectrices, when the receiving aerials are open at the top. When using aerials closed at the top the errors are constant all through and smaller than in the first case. Horizontal earth antennae substituted for the aerials above cited gave larger errors. Maximum errors, however, were in this case found in the planes of the antennae and minimum errors in the directions of the bisectrices. The form of the aeroplane antenna is of extreme importance for the exactitude of the bearings. Experiments were made with an antenna constituted by two wires stretched along the upper and down edges of the aeroplane wings: these wires were connected to a generator of undamped oscillations. At the land station 36 aerials were placed star-like. The aeroplane aerial so constituted is not directive. No errors were found, even at 3 km distance and 700 m height. But if an ordinary aerial was employed in the aeroplane the same errors as in the preceding cases were obtained. The authors consider, consequently, that the errors are due to the directive properties of the sending antennae. Many details are given and many diagrams illustrate the article. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

186. KIEBITZ, F., "New Experiments with Scheller's Direction-Finding Method," Jahrb. d. Draht., vol. 15, p. 299; 1920. ABSTRACT: Buchwald has previously described experiments with Scheller's method of direction-finding by the use of two directive aerials making a small angle with one another; his experiments were, however, carried out with aeroplanes as the receiving stations. In the present investigation the receiver was either on the ground or else mounted in a boat. Details are given of certain difficulties caused by geological conditions near the transmitter. It was ultimately found possible to obtain a sharply marked out course, which at 6 km distance was only 16 m wide. A further development of the method is described, in which a radio-goniometer, provided with two search coils at 20° to each another, is connected to the detector through a commutator. On the search coils being oriented symmetrically to the line of reception, the direction of the transmitter, which is sending out words, can be ascertained without having to seek a zero-signal position. (a-3, b-1, c-4, d-4, e-0, f-Experimental)

187. ECKERSLEY, T. L., "Refraction of Electric Waves," Radio Rev., vol. 1, pp. 421-428; June 1920. ABSTRACT: A presentation of the theory and experimental data to show that radio waves are refracted when passing obliquely from sea to land and vice versa. Observations at the direction-finding stations of Cyprus and Cairo are described which go to prove that there is a systematic bending of "rays" which cross a coast line, and that this bending behaves as if it were due to a refraction on account of the different wave velocities over sea and over land. The effect is much more pronounced with short waves. Thus, the bearings of the high-power station at Damascus, as observed at Cairo, are all very consistent on a 2600-m wave-length, and average 50.5°, which is the true bearing of the station; but the small station at Damascus working on 1000 m gives a mean bearing of 46°, although at the greatest there cannot be more than 1° difference in the direction of the two stations. This result was confirmed when the big station started working on a wave-length of 1200 m, when bearings as low as 47° were obtained. Further observations from German records at a direction-finding station at Tul Keram also showed the same effects. The results are in general agreement with the theory of propagation of electric waves over land given by Zenneck, Hack, Sommerfeld, and others. (a-3, b-1, c-1, d-5, e-0, f-Experimental and theoretical analysis)

188. HOFFMANN, H., "On the Use of Coils in Place of Open Antennas for Reception of Wireless Telegraphy," Jahrb. d. Draht, vol. 16, pp. 31-66; July 1920. ABSTRACT: This article deals with the properties of coil antennae, with the manner of calculating their self-induction, capacity, and natural oscillation period, as well as the means for diminishing capacity between the turns of the winding. The damping of several coil antennae was measured and found to vary from 0.06 to 0.15; it was found to be the same for open coils and for coils closed upon a condenser. A series of diagrams of connections between coils, audion, and heterodyne are considered and their advantages and inconveniences pointed out. The "vertical" effect of coils is considered as a means of determining the "sense" of the station in direction finding. Particulars relating to applications of coil antennae on German submarines are given. (a-3, b-1, c-4, d-4, e-0, f-Theory)

189. JACKSON, H. B., "The Use of Reaction with a Frame Aerial," Wireless World, vol. 8, no. 9, pp. 324-327 (discussion 327-328); 24 July 1920. ABSTRACT: Account of experiments in which sensitiveness of frame aerial used for DF was greatly increased by introduction of reaction. Paper read before Wireless Society of London. (a-3, b-1, c-1, d-5, e-0, f-Experiment report)

190. ANONYMOUS, "Absolute D/F with a Loop Aerial," Wireless World, vol. 8, no. 10, pp. 350-351; 7 August 1920. ABSTRACT: Frame aerial with sheet of wire gauze in center. (a-3, b-1, c-1, d-5, e-0, f-Description of patent).

191. MESNY, R., "Diffraction of the Field by a Cylinder and Its Effect on Board a Ship," Radio Rev., vol. 1, pp. 532-540; August 1920, and pp. 591-597; September 1920. ABSTRACT: The mathematical investigation developed in this article was undertaken with the object of discussing the outline of a theory for the deviations observed in a radio-goniometer aboard ship and originated by the body of the ship. The theory considers an infinitely long semi-cylinder, of infinitely conducting metal, resting on an infinitely conducting plane. The equations are expressed in the form due to Hertz and the calculations follow the same lines. When the radius of the cylinder is small in comparison with the wave-length simplification are possible. The theory shows that the cylinder produces a magnetic field in phase with the wave field and at right angles to the axis of the cylinder, and an electric field in the same direction as that due to the wave. The application of the theory to the case of a radio-goniometer on board ship shows that: (1) the error is independent of the wave-length so long as this is at least three times the length of the ship; (2) it takes a quadrantal form with maxima at bearings of 45°, 135°, 225°, and 315°; (3) the observed bearing is always nearer the axis of the ship than the true bearing; and (4) the slope of the curve is greater athwartships than in the fore-and-aft direction. Results of observations made upon four French ships agree with those of the theory. Application of the theory to direction finding on hills and, in particular, on the island of Sanguinaires, Çorsica, shows a very remarkable analogy with the case of a ship. (a-3, b-1, c-1, d-5, e-0, f-Theory)

192. ANONYMOUS, "Absolute Direction Finding with a Loop Aerial," Wireless World, vol. 8, no. 10, pp. 350-351; 7 August 1920. ABSTRACT: Frame aerial with sheet of wire gauze in center. (a-3, b-1, c-1, d-5, e-0, f-Frame aerials)

193. KINSLEY, C., AND SOBEY, A., "Radio Direction Changes and Variations in Audibility," Proc. IRE, vol. 8, p. 299; 1920. ABSTRACT: In this article are reported the results of a large number of comparative observations upon direction finding, variations of audibility, and, sometimes, intensities of strays. The bearings and the variations of audibility were obtained by using a spiral-type flat coil; the observations of the intensities of strays, by using a vertical

antenna. Bearings of a large number of stations, fed by spark, arcs, or alternators, placed at very different distances, were taken during a long period of time. No clear dependence appeared to exist between errors in bearings and values of audibility, widely fluctuating values of audibility being observed during periods of negligible changes in direction and, vice versa, large and rapid changes in direction during periods of inconsiderable changes in audibility. Similarly, the presence of strays is no indication of excessive changes in audibility or of errors in bearings. It was also found that undamped waves of great length show distortion more frequently and, in general, of a larger amount than short damped waves. In particular, bearings of the same transmitting station, taken at the same time at two widely separated radiogoniometer stations, at about the same distance from the sending station, have shown much larger errors in the case of one station than of the other. In the discussion, L. L. Israel suggested that a possible source of error in the experiments could be found in the spiral coil of flat type employed, which furnishes asymmetrical polar curves. (a-3, b-1, c-1, d-1, e-0, f-Experiments)

194. HOWE, G. W. O., "The Power Required for Long-Distance Wireless Transmission," Radio Revue, vol. 1, pp. 598-608, September 1920. ABSTRACT: In a former article the author showed that the energy radiated by an aerial of negligible ohmic resistance is one-third of the total energy furnished to the aerial when the wave-length is that corresponding to the minimum total resistance. In the present article the author proposes to show the importance of this special wave-length in the calculations of the efficiencies of the radio transmissions. The power required by a transmitting aerial for generating an electric field of 0.37 microvolt/cm at the receiving antenna, the least practically admissible from theoretical considerations and from the practical Austin formula, is shown to be $P = 15 \times 10^{-9} D^2 \times e^{0.003D/\sqrt{\lambda}}/\eta$ kilowatts, where D is the distance and λ the wave-length, both in km, and η the efficiency of the aerial, namely, the ratio between the radiated power and the total power furnished to the aerial. The value of η is calculated on the lines of the former article and is a function of λ. P is therefore a complicated function of λ. Calculations made by the author for different values of D, λ, and of the resistance of the aerial show the great importance of transmitting at the wave-length for which the total resistance is minimum. This condition coincides with that of using aerials with such small dielectric losses that the minimum total effective resistance is reached at long wave-lengths. Due consideration, however, of the max. voltage which an aerial can withstand, renders it obligatory sometimes to work at shorter wave-lengths. Many tables and diagrams illustrate the article. (a-3, b-1, c-1, d-5, e-0, f-Theory)

195. AUSTIN, L. W., "Quantitative Experiments with Coil Antenna," Proc. IRE, vol. 8, pp. 416-420 ; 1920. ABSTRACT: If in the expression for the current received in a vertical antenna from a sending antenna of effective height h, the effective height of a coil antenna is substituted for h, the received current intensity in the case of (1) Coil sending and antenna receiving, is obtained. By analogous substitutions the received current intensities in the cases of (2) Antenna sending and coil receiving, and (3) Coil sending and coil receiving, are derived. Experiments made by the author and reported in the present article show that in case (2) the observed values are larger than the calculated ones, which is believed to be due to the action of the loops as vertical antennae, whilst in the case (1) the observed and the calculated values are practically the same. (a-3, b-1, c-1, d-1, e-0, f-Theory)

196. PICKARD, G. W., "Static Elimination by Directional Reception," Inst. Radio Eng., Proc. 8, pp. 358-394, Disc. 395-415; October 1920. ABSTRACT: The author sets forth a theory according to which atmospheric disturbances interfering with radio-telegraphic reception are, at least in great part, due to cosmic clouds of charged particles travelling in the interplanetary spaces and reaching the earth's atmosphere. The object of this article is to publish the results of experiments in which directional reception was used for preventing or limiting the disturbances due to statics. After a description of the known bilateral and unilateral systems the author describes some forms of unilateral circuits employed at Otter Cliffs, Maine, for receiving European stations. Figures of the relative intensities of signals and statics (strays) for vertical antenna, loops and unilateral systems, respectively, are given, showing that the last one is the most free from atmospheric disturbances. It is interesting to note that the unilateral system consisting of a loop and of a vertical antenna has given better results than the other arrangements in which the loop formed at the same time the vertical antenna. In the discussion, H. H. Beverage remarked that, since on the North Atlantic coast the statics come in large proportion from S.W., whilst the European stations are in the general N.E. direction, only the unilateral system could solve the problem in this particular case. He obtained the same results with a barrage receiver. C. A. Hoxie reports some experiments made with two equal loops provided with photographic recording apparatus. When both loops were in the same position both records were the same. When the loops pointed in different directions, impulses affecting one loop did not necessarily affect the other. The photographic records are reproduced and show that on North Atlantic coast the strays were maximum when the loop was directed N.E.-S.W. (a-3, b-1, c-1, d-1, e-0, f-Theory and experiment)

197. HOLLINGWORTH, J., AND HOYLE, B., "Local Errors in Wireless Direction Finding," Radio Rev., vol. 1, pp. 644-649; October 1920. ABSTRACT: In the present article the authors examine the causes of errors in direction finding, due to local interferences at the receiving end. These causes are grouped under four headings, namely: (1) masses of metal, (2) large conducting surfaces, (3) tuned circuits, and (4) telegraph and telephone lines. Masses of metal, such as funnels, masts, etc., in the case of ships or engines, bombs, etc., in the case of aeroplanes, produce errors not generally larger than 10°. A correction chart can be obtained when the position of the metallic masses is invariable. The action of these masses is localised to their immediate neighbourhood. Small rotating coils can, consequently, be largely influenced by these masses. On larger coils this action is much less sensible. It has been found that by the use of large coils in the Bellini-Tosi method this permanent error is very much reduced. The group (2) is intended to refer to the case of iron buildings in the immediate neighbourhood of the receiving coil. Under ordinary conditions no visible errors are due to this cause: even experiments made with a coil mounted at the top of a building containing the usual metal work, on the border of a flat portion of a metallic roof, showed no sensible error. Inside an iron building the error does not appear to be very serious if the building is completely encased in metal work; in a metal shed open at one end, however, the waves from all stations appear to be deflected along the axis of the shed. Tuned circuits, as grouped under the heading (3) include both external circuits tuned to the same or nearly the same wave-length and also radiation from parts of the receiving circuit itself. When using a transformer amplifier any movement of this may make a considerable difference in the bearings, unless the amplifier is shielded or several feet from the coil. Closed coils tuned to the same wave-length appear to have a serious effect at a distance of several feet; open aerials, at a much greater distance. No visible effect is produced if the aerial is tuned to a wave-length greater than twice the wave-length of the coil, or if the aerial is insulated, or earthed in an untuned condition. Telegraph and telephone aerial lines produce large errors, independently of the fact that they are single-wire lines with earthed return or twin wire not earthed at any point. In some cases the errors are such as to shift the bearings towards the perpendicular to the telegraph and telephone lines, sometimes in the actual direction of these. The errors vary according to the fact that some lines are switched in or not and are, therefore, quite outside the control of the wireless operator. It thus appears to be desirable that telegraph and telephone lines should run underground for at least several hundred yards from the wireless direction-finding apparatus. (a-3, b-1, c-1, d-5, e-0, f-Experiments and measurements)

198. PRINCE, C. E., Correspondence on "A Method of Direction-Finding of Wireless Waves," Radio Revue, vol. 1, pp. 695-700; November 1920. ABSTRACT: This article is a criticism of Robinson's method of direction finding. The author demonstrates that this method is not, as claimed, a maximum method, but, like the single rotating loop and the Bellini-Tosi method, a minimum method. As a matter of fact the so-called "main coil" is, at the moment a bearing is being taken, in the plane of the arriving signal and, consequently, the variation of the signal strength by a small movement of a few degrees is negligible. The so-called "auxiliary coil," on the contrary, being at right angles to the arriving waves, is working about its minimum, where the rate of change is greatest, and it really does all the work. The Robinson method would, therefore, be equivalent to the original primitive loop, but with the addition of a constant signal. This does not constitute a technical, but a human or psychological factor, as it allows the operator to hear and read the signal during the whole period of searching. The author does not think that Robinson's claim that the human ear can more easily judge of the relative strength of signals which succeed each other rapidly without passing through silence has some basis. (a-3, b-1, c-1, d-5, e-0, f-Theory)

199. BURSTYN, W., "Wireless Telegraphy in Space; a Space Direction-Finder," Jahrb. d. drahtl., vol. 16, pp. 322-337; November 1920. ABSTRACT: This article deals with the theory of wireless communication between aeroplanes, between aeroplanes and earth stations, and of the direction-finding of aeroplanes. These latter are supposed to be provided with trailing antennae. The results of the theory generally agree with the results of experiments; some results,

however, differ considerably. The author attributes these divergences both to errors in experiments and to local influences upon the direction-finder. In particular it is interesting to notice the great difference between theory and experiment in the values of the received current intensity as a function of the distance. A space direction-finder. -- A brief account of a wireless direction-finder devised by the author, claimed to be free from errors and furnishing the space direction of an aeroplane, and not merely the direction of its horizontal projection, concludes the article. This apparatus essentially consists of a loop and of a short, straight antenna, mechanically connected to it so that the apparatus can be orientated in all the possible directions of space. The detector is contained in the straight antenna. (a-3, b-1, c-4, d-4, e-0, f-Theory)

200. ECCLES, W. H., "Recent Progress in Radio-Telegraphy," Inst. El. Eng., J. 59, pp. 77-84; December 1920. Inaugural Address to the Wireless Section, Engineering, 110, pp. 783-785; 10 December 1920. See also El. Rev., 87, pp. 827-829; 24 December 1920; Radio Revue, 2, pp. 31-37, January 1921. ABSTRACT: A brief account is given of the present position of wireless technology and a review of the work of the Wireless Section of the IEE. The growth of importance of the thermionic valve since 1913 is dealt with and the author suggests that this is now at the same stage of development as the dynamo-electric machine of 40 or 50 years ago. Some space is then devoted to methods of measuring the voltage factor of valves, i.e., the ratio of free emf in a valve's anode circuit in response to that applied in the grid circuit, and to the measurement of internal resistance. A very interesting feature of this paper consists in the illustrations of models of surfaces constructed from valve determinations, and the geography of such models is described. Attention is then devoted to recent work in directive telegraphy, and the errors that arise at periods of dawn and sunset, which Eckersley has suggested may be due to rotation of the plane of polarization by reflection at the Heaviside layer. The author offers an explanation of this rotation as being due to obliquity of the ion's velocity due to the earth's magnetic field and gives numerical data bearing out his view. The difference between the requirements of magneticians and wireless investigators as regards the conducting layers of the atmosphere is pointed out. The lecturer in conclusion deals with possible future developments. (a-3, b-1, c-1, d-5, e-0, f-History and review)

201. PRESS, A., "Theory of Antenna Radiation," Proc. IRE, vol. 8, no. 6, pp. 525-540; December 1920. ABSTRACT: Theory is developed taking into account sinusoidal distribution of current and voltage along antenna. Only vertical grounded antenna is considered. Detailed mathematical investigation of radiation and field strengths at remote points is included. (a-3, b-1, c-1, d-1, e-0, f-Theory)

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202. BALLANTYNE, S., The Radio Compass, Yearbook of W.-T., p. 1131; 1921. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

203. WALTER, L. H., Directive Wireless Telegraphy, Pitman; 1921. ABSTRACT: Not available. (a-4, b-6, c-1, d-0, e-0, f-0)

204. FERRIÉ, G. R., MESNY, R., JOUAUST, R., AND PEROT, A., "Radio Direction-Finding Studies," Comptes Rendus, vol. 172, pp. 54-56; 3 January 1921. ABSTRACT NO. 1: Communications to the Academie des Sciences concerning night D/F errors. This error may be as great as 50°. The explanation given is multiple-path propagation and refraction. ABSTRACT NO. 2: The authors report the results of a long series of observations upon the errors of the azimuths of sending stations obtained by the direction finder of the Observatory of Meudon, near Paris. Very interesting results were obtained, which can be summarised as follows:--(1) In the day-time the errors are very small. (2) A sudden error appears at the beginning of the night, which is later replaced by an error contrary in sense, lasting till sunrise. (3) The first night error uniformly diminishes when autumn approaches and disappears in the month of November. (4) Some stations give errors of contrary sense to those of some other stations. (5) The known fact that often no direction of zero reception can be obtained was confirmed. A suggestive diagram of the errors observed during night-time from May 21 to Sept. 30, 1920, in the azimuths of the Hanover station is given. This diagram shows, moreover that the errors appear earlier in the evening in the months of Aug. and Sept. than they do in May and June. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Experimental results)

205. ECCLES, W. H., "The Capacitance of Flat Top Antennae," Electrician, vol. 86, no. 226, p. 72; 14 January 1921. ABSTRACT: Formula for antennae capacitance. (a-3, b-2, c-1, d-1, e-0, f-Formula)

206. BELLINI, E., "The Errors of Direction Finders," Electrician, vol. 86, pp. 220-222; February 1921. ABSTRACT: It is well known that the bearings obtained by the use of direction finders are often very inexact. By utilising the facts published by Round, Hoyt Taylor and others and by admitting, with them, that the cause of the errors is due to the reflection of the waves from the Heaviside layer, the author develops a theory founded upon geometrical optics, which would explain errors as high as 90°. According to this theory the Heaviside layer acts as a mirror. The action of this mirror can be replaced by that of an image symmetrical with that of the transmitting station. The Heaviside layer produces, therefore, what Round calls an "aeroplane effect." The receiving station has, consequently, to locate two stations at the same time: the real one and its image high in the sky. The first one always gives exact bearings, the second, however, can give bearings rotated by as much as 90°. The author demonstrates that these errors are due to the action of the horizontal parts of the sending antenna upon the horizontal parts of the receiving antenna. The remedy for these errors would therefore, according to this theory, consist in suppressing the horizontal parts either of the transmitting antenna or of the receiving antenna, or of both. Explanations of some connected phenomena, such as the influence of the wave-length and of the damping upon the errors, are also given. (a-3, b-1, c-1, d-5, e-0, f-Theory)

207. AUSTIN, L. W., "The Wave-Front Angle in Radiotelegraphy," Journ. Wash. Acad. Sc., vol. 11, pp. 101-106; 4 March 1921. ABSTRACT: Theoretical considerations had brought physicists to admit that in radio-telegraphic transmissions the advancing wave-front made with the earth an angle generally different from 90°, in dependence upon the earth's electric properties. The author has made experiments for the purpose of verifying these theoretical deductions. For this purpose a straight, ungrounded antenna was employed, 60 ft long, mounted at the top of a 55-ft wooden pole so as to be capable of rotation about a horizontal as well as a vertical axis. The antenna was cut in the middle and the two halves were connected by the receiving apparatus. The observations were made by first setting the antenna vertical with the horizontal axis approximately in the plane of the wave-front and subsequently by rotating it about the horizontal axis both ways till signals died out, as in a radio-compass. Two other similar positions were obtained after switching the antenna and the receiving apparatus. The mean of the four positions was taken as the value of the wave-front angle. Special precautions were taken to avoid the influences of parasitic capacities. The sending stations utilised for the experiments sent waves longer than 10,000 m. The deviations of the wave-fronts from the vertical were found to vary from +3.4 (forward sloping) to -2.2 (backward sloping). The San Diego station, the waves of which travelled entirely over the ground, gave only -0.8. No dependence was found between the well-known shift of the apparent direction of the New Brunswick station, as obtained with a radio-compass, and the bending of the wave-front. The wave-front of static disturbances was determined with considerable accuracy, and it was found that, contrary to the hypothesis that "static" (atmospheric strays) comes from above, the "static" wave-front is always practically vertical, like the signal. (a-3, b-1, c-1, d-1, e-0, f-Experiments)

208. ARTOM, A., "Notes on a Direct-Reading R.D.F.," Radio Revue, vol. 3, pp. 14-17; 20 March 1921. ABSTRACT: A description is given of several proposed forms of direct-reading instrument for direction finding. In one type there are two coils fixed at a certain angle, and capable of rotation about a vertical axis in the field of a permanent magnet. These coils are connected, through amplifying triodes and rectifiers, to two similarly oriented loop aerials. A pointer attached to the coils serves to indicate the direction of the received signals. In the second type the arrangement is similar, but the coil deflection is obtained by using a thermal effect as in the Boys radiomicrometer. The third type consists of two coils, both being fixed, and corresponding loops. The coils are traversed by rectified currents from the incoming signals. Suspended in the field of these coils is an astatic needle of magnetic material. (a-3, b-1, c-9, d-9, e-0, f-Description)

209. CARSON, JOHN R., "Wave Propagation over Parallel Wires," Phil Mag., pp. 607-633; April 1921. ABSTRACT: The importance of the problem dealt with in the present paper - wave propagation along a conducting system composed of two similar and equal parallel wires - has been emphasized by modern developments in telephonic trans-

mission such as the carrier wave system of the American Telephone and Telegraph Company, and the utilization of loaded cable circuits in which the wires are in very close juxtaposition. For such systems, where the frequencies employed are relatively high and the wires very close together, considerable theoretical work has been found necessary to reduce the solution to a form available for immediate engineering use, in spite of the previous valuable researches of such mathematicians as Mie and Nicholson. In the present paper the analysis of the problem starts with Maxwell's equations, but one simplifying assumption is introduced ab initio - namely, that the exponential propagation factor is a small quantity. The approximations involved in this assumption are fully justified in all physical systems which could actually be employed for the transmission of electrical energy; so that from a practical standpoint the restriction thus imposed on the generality of the solution is purely formal. By aid of this simplifying assumption the determination of the current distribution in the wires is essentially reduced to a two-dimensional problem, which is solvable from the boundary conditions satisfied by the tangential magnetic force and the normal magnetic induction at the surfaces of the wires. With the current distribution in the wires thus determined, the exponential propagation factor γ is solvable by applying the law curl $E = -\mu d/dt\, H$ to an appropriate surface bounded by a contour which includes line elements in the surfaces of the wires. By this means it is shown that the propagation factor satisfies an equation of the form

$$\gamma^2/ipK = 2Z + ipL$$

where K is the electrostatic capacity between wires, Z the "impedance" of the wire per unit length, and L the inductance corresponding to the magnetic flux between the wires. This equation is of exactly the same form as that derivable from the telegraph equation, but differs therefrom in that Z and L are both functions of the frequency $p/2\pi$ and the parameter k (ratio radius of wire to interaxial separation between wires). As formulated in the present paper, the actual calculation of Z and L involves only the computation of Bessel functions. (a-1, b-1, c-1, d-1, e-455, f-Basic theoretical analysis)

210. PEPERKORN, H., "The Underground Antenna and Its Use in the German East-Africa Wireless Stations during the War," Telegraphen- u. Fernsprech-Technik, vol. 10, nos. 4 and 5, pp. 36-41 and 55-60; April and May 1921. ABSTRACT: Writer tells of successful use of underground antennae for communication with Nauen during war, and enumerates their advantages over tower antennae for reception. (a-3, b-2, c-4, d-4, e-0, f-Experiment)

211. PESSION, G. "Measurement of the Effective Height of Radiotelegraphic Aerials," Elettrotecnica, vol. 8, no. 11, pp. 237-238, 15 April 1921. See also Radio Revue, vol. 2, no. 5, pp. 228-231; May 1921. ABSTRACT: Describes method for measuring effective height of nondirectional radiotelegraphic aerials when three stations are available. Method applied to three stations, one of which was that of Rome-San Paolo, gave, as effective height of aerial of this station, the value of 136 m. (a-3, b-1, c-9, d-9, e-0, f-Description)

212. PRESS, A., "The Radiation Resistance of Various Types of Antenna Construction," JIEE, vol. 59, no. 300, pp. 349-442; April 1921. ABSTRACT: Derivation of formulae. (a-3, b-1, c-1, d-5, e-0, f-Formula)

213. REISS, W., "Directivity of the Marconi Bent Antenna," Jahrb. d. drahtl., Tele, vol. 17, pp. 294-299; April 1921. ABSTRACT: Technicians are not in agreement regarding the directive properties of the Marconi bent antenna; thus the directivity is admitted by some and denied by others. The author has made methodical experiments in order to decide this point. As some investigators admitted that the directivity could be due to the bad conductivity of the earth in the neighbourhood of the antenna, a badly conducting soil was chosen for the experiments. In order to get free from subjective influences, the method adopted for the experiments consisted in using two identical antennae pointing in opposite directions and in sending, as in Scheller's method, the letter a from one and the letter n from the other, so that in the directions of equal radiation a continuous dash should be heard. Each antenna was 105 m long and 4.5 m high, and was inductively excited by a vacuum-tube oscillation generator. Special precautions were taken in order to secure that the two antennae were absolutely identical. The receiving station was 30 km distant. The realisation of identical notes and wave-lengths from the two aerials was very difficult to obtain when using loose coupling and resonance conditions; for this reason rather tight couplings and a slight mistuning were employed. The wave-lengths used were 550 m and 2500 m. The results of the experiments showed that no difference in directivity of more than 3% could be obtained. (a-3, b-1, c-4, d-4, e-0, f-Experiment)

214. WINTERS, S. R., "New Type of Condenser Antenna," Wireless Age, vol. 8, no. 7, pp. 11-14 and 16; April 1921. ABSTRACT: Low antenna having two horizontal metal condenser plates. (a-3, b-2, c-1, d-5, e-0, f-Description)

215. ECKERSLEY, T. L., "Effect of the Heaviside Layer upon the Errors of Direction Finders," Radio Revue, vol. 2, pp. 60-65, 231-248; May 1921. ABSTRACT NO. 1: Experimental data on errors in D/F systems due to reflection from the ionosphere. A theoretical discussion of these effects. ABSTRACT NO. 2: If the experiments in this paper are considered to be valid then the existence of a ray reflected at night time from some upper conducting layer of the atmosphere may be considered to be beyond doubt, and the fact that this ray is responsible for part of the errors in night bearings may also be taken as proved. But a doubt still exists if this is the only way in which errors are produced, and it is still uncertain whether the errors are due to a ray reflected in a purely vertical plane from a perfectly horizontal conducting layer, or by reflection from a partially tilted layer. Probably both these causes of error exist. Experiment as described on p. 239 should determine this point. The manner in which the ray is reflected is suggested in the later, more speculative, part of the paper and it seems that a possible explanation is offered, and that the numerical values of the conductivity and rate of increase of conductivity with height required by the theory are not impossible. Many points in connection with this subject have not been touched upon for instance the apparent systematic swinging of bearings at sunset, and the variation of bearings taken on radiophare stations as the transmitter rotates, as observed by Captain Tremellen, and his results on the sunset variations of the strength of signals from Clifden all of which might probably be explained on the reflection theory, but the satisfactory result remains that a reasonable explanation of night effects has been offered and confirmed by experimental results. ABSTRACT NO. 3: Various loop arrays are described including a spaced loop. (a_1-6, a_2-1, a_3-4, b-1, c-1, d-1, e-714, f-Early theoretical and experimental investigations of historical value)

216. HUND, AUGUST, "Formulas for the True, Effective and Apparently Effective Constants of a Horizontal Antenna" Jahrbuch Zeit. für drahtlose Telegraphic u. Telephonic, vol. 17, no. 5, pp. 349-365; May 1921. ABSTRACT: Described method gives solutions for antenna constants of long horizontal antennae in the case of sine-shaped distributions. Experiments with different antennae show that even for ordinary excitation, formulas give good approximate values. (a-3, b-1, c-4, d-4, e-0, f-Description)

217. ROTHE, E., "The Influence of Atmospheric Conditions on R.D.F," Comptes Rendus, vol. 172, pp. 1345-47; 30 May 1921. ABSTRACT: The author reports the results of experiments made in Strassburg for determining whether atmospheric conditions had any influence upon the errors in the bearings. The radiogoniometer used was constituted by a simple rotating loop: the sending stations observed were those of Nauen, Poldhu, and the Eiffel Tower, the observations being made in the day-time from July to Oct. 1920. Errors of one or two degrees were observed; but though the meteorological conditions were very variable, no interdependence could be ascertained between these and the errors in bearings. (a-3, b-1, c-3, d-3, e-0, f-Experiments)

218. ANONYMOUS, "Aerial Navigation by Radiogoniometry," Vie technique and industrielle, vol. 2, no. 21, pp. 214-217; June 1921. ABSTRACT: Operation of radiogoniometry. (a-3, b-2, c-3, d-3, e-0, f-Description)

219. HOLLINGWORTH, J., "Directional Measurements with the R.A.F. System," Radio Revue, vol. II, pp. 282-301; June 1921. ABSTRACT: This system is that invented by J. Robinson and already described by him. The present paper is a supplement to it, and deals in fuller detail with the scientific side of the system. The causes influencing the exactitude of the bearings, or the sensitivity, are analysed in detail, and, in particular, the manner of avoiding the 90° ambiguity in the bearings is considered. Laboratory experiments were made for determining the least change distinctly audible for a given signal strength and how the magnitude of this change varies with the original signal strength. In conclusion, the author affirms that for a sensitivity of 1° or over, very few precautions either in design or operation need be taken. From 1° to 1/2° more care is required, but below 1/2° the possible errors multiply very rapidly. (a-3, b-1, c-1, d-5, e-0, f-Theory)

220. ETTENREICH, H., "High-Frequency Amplifiers and Frame

Antennae," Elektrotechnik u. Maschinenbau, vol. 39, no. 26, pp. 313-316; 26 June 1921. ABSTRACT: Describes working effect of vacuum tubes, and deals with high-frequency amplifiers, and frame antennae, principles and advantages of which are pointed out. (a-3, b-2, c-4, d-4, e-0, f-Description)

221. BENNETT, J. J., "Systems of Direction-Finding by Wireless," Electrician, vol 87, pp. 134-136; July 1921. ABSTRACT: A short summary of pertinent factors concerning simple rotating or crossed-fixed loops. (a-6, b-1, c-1, d-5, e-0, f-Theoretical analysis)

222. WRIGHT, G. M., AND SMITH, S. B., "The Heart-Shaped Diagram and Its Behavior under Night Variations," Radio Revue, vol. 2, pp. 394-403; August 1921. ABSTRACT NO. 1: An early paper on the "heart-shaped" or cardioid pattern, which may be used to obtain unilateral bearings. The possibility of reducing night-effect errors by using this system is pointed out. A method of phasing the outputs from the sense and loop antennas it presented. ABSTRACT NO. 2: The unilateral system studied by the authors is formed of a Bellini-Tosi radiogoniometer, the primaries of which form part of two non-oscillating frames, tightly coupled to the oscillating circuit in which the exploring coil is inserted, and of a resistance-loaded vertical aerial acting inductively upon the same circuit, which in turn acts upon the oscillating circuit containing the amplifier or the detector. The tuning of the two perpendicular aerial loops can therefore be obtained by simply acting upon the condenser of the circuit of the exploring coil. In order to obtain a perfect balance, and consequently a good zero, the natural frequency of the open aerial circuit must be made a little higher than the frequency of the received wave. The theory of the night variations, based upon the reflection of the waves at the Heaviside layer, and the experiments of the authors show that the night conditions can more or less distort the heartshaped diagram of the system, but that the zero, or, at least, one of the zeros (as in some cases the diagram can present two zeros) always lies in the right direction. Some diagrams show the forms that the characteristic curves of the system can assume under different phase shiftings between the direct and the reflected rays. It is interesting to note that, using the Bellini-Tosi direction finder, the difference in bearing of the marking and spacing waves of the Lyons station often differed by 45°. A diagram of signal strength and errors in bearings for Clifden, determined with the same apparatus, shows neatly that when the signal strength is minimum the errors are maximum, and vice versa. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

223. BENNETT, J. J., "Direction-Finding Wireless," Engineering, vol. 112, no. 2905, pp. 333-335; 2 September 1921. ABSTRACT: Discusses three types which may be employed, namely, direction-finding, beacon, and directional transmitting station types. (a-3, b-2, c-1, d-1, e-0, f-Discussion)

224. MESNY, R., "Direction Finding Tests Conducted on Hills," Navy Department RE 6?A 161A; October 1921. ABSTRACT: Direction finding site errors due to the presence of local hills are described. (a-4, b-3, c-1, d-1, e-0, f-Experiments)

225. BION, J., "The Use of Radio Direction Finders in Navigation," Radio Electricite, vol. 2, pp. 218-221; November 1921. ABSTRACT: Discussion on the utility of placing the D/F on the ship or on the coast: it seems better to have the D/F on the mobile unit for various reasons. (a-6, b-1, c-3, d-3, e-0, f-Theory and description)

226. LOTH, W., "On the Solution of the Problem of Guiding Aircraft through Fog or Night without Visibility," Comptes Rendus, vol. 173, pp. 1152-1154; December 1921. ABSTRACT: A description is given of a "leader cable" system for aircraft, installed at the Villacoublay aerodrome. The cable used is an old power line, about 3 km in length, which is far from straight, the longest straight portion being only 565 m. Better results would probably be obtained with a straight cable of greater length. The cable is fed with alternating current at 600 ~ per sec, and the far end of the cable and one terminal of the alternator is earthed just as with submarine leader cables. For reception of signals from the cable, an aeroplane is fitted with three coils, two vertical and perpendicular to one another and the third horizontal. One of the vertical coils is in the fore-and-aft line, and receives maximum signals when the aeroplane is flying parallel to the cable. The more the direction of the aeroplane is inclined to the cable the weaker are the signals received on this coil, and the stronger are those received on the coil at right angles to it. Reception on the horizontal coil is possible on both sides of the cable, but when immediately over the cable signals on this coil fall to zero, the fall to zero taking place very rapidly. The two vertical coils, which are rigidly connected together, may be rotated through 45° about a vertical axis, and a goniometer arrangement may be used to give the degree of inclination to the direction of the cable. Various series arrangements of the three coils allow the direction of the cable to be ascertained. Magneto disturbances are eliminated by using a small coil, near the magnetos, in series with the main receiving coils. The constants of the small coil are so chosen that the effects set up in it by the magnetos counterbalance those set up in the main coils farther from the magnetos. Using a low-frequency amplifier signals are audible on the horizontal coil at 3000 m and on the vertical coils at 2500 m. At 2000 m the cable can be followed, the range of audibility being about 2000 m on either side of the cable. The range increases as the altitude decreases, and is about 15 km at ground-level. These results were obtained with a cable current of 3 to 4 amps. A proper installation would permit aircraft to land either in fog or at night, and with a radial set of wires one could always be chosen so as to enable aircraft to land head-to-wind. (a-3, b-1, c-3, d-3, e-0, f-Qualitative description)

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227. BREIT, G., "The Field Radiated from Two Horizontal Frames," Sc. Pap. Bur. Stand. No. 431, vol. 17, p. 589; 1922. ABSTRACT: The landing of aeroplanes can be facilitated by emitting from the landing field a vertical beam of radio-frequency electromagnetic radiation. A types of transmitting coil antenna has been devised for this purpose by J. A. Willoughby, of the Bureau of Standards. The behaviour of this transmitting coil antenna is calculated in the paper. Formulae are worked out for the current received in a coil aerial and in an antenna oriented in a known manner at a sufficient distance from the transmitter. It is found that if a vertical coil aerial is used for reception and if the aeroplane flies horizontally a maximum signal is obtained when the distance ℓ makes an angle of 30° with the vertical. The influence of the earth is also discussed for the case when the earth may be considered as a perfect conductor. In both cases it was found that the energy was sent out by the transmitter into a region which is very similar to what would be obtained by constructing two coaxial circular cones having a common apex and a vertical axis, the cones themselves being inverted and cut off at a proper height (perhaps a mile or more, depending on the sensitivity of the receiving apparatus). (a-1, b-1, c-1, d-1, e-0, f-Theory)

228. BROWN, S. L., AND BONER, C. P., "Free Modes of Oscillation in Loop Aerials," Phys. Rev., vol. 20, p. 90; 1922. ABSTRACT: Loops with widely separated turns were investigated to ascertain their modes of oscillation when excited (1) by a spark in the loop circuit, (2) by damped oscillations in a circuit loosely coupled to the loop, and (3) by undamped oscillations. (a-6, b-1, c-1, d-1, e-0, f-Experiments)

229. DUNMORE, F. W., "Methods of Radio Direction-Finding as an Aid to Navigation. The Relative Advantage of Locating the Direction Finder on Shore and Shipboard," Circular Letter No. 56 U. S. Bureau of Standards; 1922. ABSTRACT: The relative advantages of locating the direction finder on shore and on shipboard. (a-4, b-3, c-1, d-1, e-0, f-0)

230. HOFFMAN, H., "Formulas for the Construction of Loop Aerials, a Consideration of Flat Coils and Special Types," Radio Digest Illust., vol. 3, p. 13; 1922. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-Theory)

231. HOWE, G. W. O., "The Heaviside Layer," Electrician, vol. 89, p. 260; 1922. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

232. JACKSON, H. B., "Directional Effects with Frame Aerials," Wireless World, vol. 9, p. 789; 1922. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

233. PLETTS, J. St. V., An Azimuthal Zenithal Graticule, Yearbook of W.-T.; 1922. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

234. SCHMID, Maj. A. D., Correspondence on "Refraction of Electric Waves," Jahrb. d. Draht, vol. 19, p. 166; 1922. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Theory)

235. SMITH-ROSE, R. L., "Coil Reception in Radio Telegraphy," Electrician, vol. 89, p. 533; 1922. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

236. SMITH-ROSE, R. L., AND BARFIELD, R. H., "The Effect of Underground Metal Work on Radio-Direction Finders," Wireless World, vol. 11, p. 165; 4 November 1922. ABSTRACT: D/F errors related to buried conductors are summarized. Authors proved that in a site where there exists a large metallic object, even though buried to a depth of 8 ft, serious errors can be found. If this mass has a large length-to-width ratio, the errors become much more serious than those of metallic fence a short distance away. (a-6, b-1, c-1, d-5, e-0, f-Experiments)

237. THOMPSON, ELIHU, "A Short Story in Wireless," Electrician, vol. 89, p. 148; 1922. See also correspondence in Electrician, vol. 89, p. 242. 1922, by T. L. Eckersley. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

238. WHITTEMORE, L. E., "Objects that Distort Radio Waves," Radio B'cast., vol. 1, p. 101; 1922. ABSTRACT: Not available. (a-4, b-2, c-1, d-5, e-0, f-Review)

239. STOYE, K., "Atmospheric Conditions and Electric Waves," Jahrb. d. drahtl., vol. 19, pp. 58-72; January 1922. ABSTRACT: The results of methodical observations made near Strassbourg in 1916 and 1917 in order to discover the influence of atmospheric conditions upon the errors in wireless direction-finding and upon the intensity of reception are here published. The apparatus used for the experiments was a modified form of Bellini-Tosi radiogoniometer with tuned aerial circuits and aperiodic detector circuit. Only damped-wave reception was experimented with. In the day-time the errors in bearings were almost nil (± 1°); at night-time, however, they reached sometimes 30°. Extraordinary variations of bearings were observed at sunrise. The barometric conditions showed a decided influence upon the bearings and the intensity. As soon as curls appeared in the sky, preceding a barometric depression, bearing variations began to appear and the intensity of reception diminished. In summer the arrival of these curls coincided with a sudden increase of strays. The influence of winds if mainfest. North and east winds are more favourable than south and west winds. Night storms with strong rain or snowfalls produce large errors in bearings. Day storms, on the contrary, produce no errors. Details and tables are given of errors in the bearings of the following stations: Madrid, Aranjuez, Barcelona, Lyons, and Königswusterhausen. Generally, the errors at sunrise are larger than at sunset. Errors in bearings are always accompanied by diminution of the reception intensity, so that the two corresponding curves are almost equal and parallel. The influence of the moon is very marked: the moment of moonrise or moonset could be determined exclusively from the instant when errors appear or disappear, or from the instant when the reception intensity begins to vary (a-3, b-1, c-4, d-4, e-0, f-Experiments)

240. KOLSTER, F. A., AND DUNMORE, F. W., "The Radio Direction Finder and Its Application to Navigation," Sc. Rep. Bur. Stand., no. 428; January 1922. See also Onde Elec., vol. 1, p. 417; 1922. ABSTRACT: Although this paper is entitled "The Radio Direction-Finder," it really only deals with the solenoidal-coil type of direction-finder developed by the Bureau of Standards. The chief features which distinguish it are: (1) the mounting of the direction-finder coil directly over the magnetic compass; (2) the provision, exterior to the magnetic compass card, of a correction scale for obtaining a corrected wireless bearing; (3) the use of a balanced method of coupling in the unidirectional antenna system. Calibration curves are given and also charts of runs made by means of wireless "bearings." (a-3, b-1, c-1, d-1, e-0, f-Description)

241. ERSKINE, M. J., AND ROBINSON, J., "Directional Transmission of Electromagnetic Waves for Navigational Purposes," JIEE vol. 60, p. 352; March 1922. See also Electrician, vol. 88, p. 315; 17 March 1922. ABSTRACT. The paper criticises the differences between directional transmission and reception as used in navigation and describes in particular a number of directional transmission methods which have been developed by the Royal Air Force. These methods include several in which the determination of a bearing depends on the timing of the moment of equality of signals as heard in the receiver, and also include a new class of directional transmitters in which a characteristic of the radiation, such as a particular wave-length, is allotted to each direction in azimuth. (a-3, b-1, c-1, d-5, e-0, f-Theory)

242. DUNMORE, F. W., "Radio Direction Finding as Aid to Navigation," Shipping, pp. 10-12 and 16; 25 April 1922. ABSTRACT: Provision of radio-direction-finding equipment on board ship may eliminate serious delays due to fog or may be means of saving lives in case of wreck. (a-3, b-2, c-1, d-1, e-0, f-Evaluation)

243. PICKARD, G. W., "The Direction and Intensity of Waves from European Stations," Proc. IRE, vol. 10, pp. 161-175; June 1922. ABSTRACT: Experiments made for studying the variations of the apparent bearings and intensities of reception of European radiotelegraphic stations are reported. In 1908 the author discovered the unfavourable influence of a river upon the apparent bearing of a station. But other causes, generally attributed to the influence of the Heaviside layer, produce other types of errors, the study of which was the purpose of the present experiments. The coil aerial employed for the experiments was 10 ft square, 20 turns, 1 inch apart. Large condensers were used for tuning purposes: 0.013 mfd for Nauen and 0.045 mfd for Bordeaux. The polar curve diagram given by the frame aerial for the Marion station, 150 km apart, was regular. The station was established at Seabrook Beach, a low, sandy strip of land, some 3 metres above high-tide level, on the Atlantic Ocean. The great circles passing through Seabrook Beach on one side and either the Nauen or the Bordeaux stations on the other side run grazingly along the U. S. coast. Over a thousand observations were made in the month of August 1921. In no single instance was there an uncertainty as to the null point: no sudden changes in direction were observed, the bearings simply drifting from side to side of the mean bearing: no marked changes in bearings occurred either at sunrise or sunset. All the deviations both of Bordeaux and of Nauen were found to be to the east of the true bearing. They were generally small during the first part of the month and increased markedly during the last week of August. Concurrently with the bearings, intensity measurements were made by using a comparison method described in the paper. It was found that both for Bordeaux and Nauen the signals rose appreciably in intensity coincidently with the periods of maximum deviation from true bearing. On the night of September 1-2, 1921, a strong aurora developed. The Bordeaux station was sending. The aurora seemed to be without effect upon either the bearing or the intensity of Bordeaux: even statics came in from about the normal bearing and with the usual intensity, during the phenomenon. At the same time a few bearings of European stations were taken on some U. S. stations, which, with the exception of Glace Bay, were received entirely overland. Only the San Diego station showed a large persistent error of about 10 degrees. The other stations gave small deviations, of the same order as those observed for the European stations. (a-3, b-1, c-1, d-1, e-0, f-Experiments)

244. HOLLINGWORTH, J., "Notes on the Design of the Closed Coil Receiving Sets," Wireless World, vol. 10, p. 351; 17 June 1922. ABSTRACT: Experiments are described relating to the most effective arrangement of coil and amplifier for the reception of wireless signals. It appears that the size of wire used in the coil is a matter of minor consideration. It only becomes a deciding factor when the losses in the amplifier are negligible. The latter implies a transformer at any rate between the first two valves, and if this be designed so as to make the apparent resistance of the set practically zero, the set will be extremely unstable and liable to oscillate at the least provocation. For reliable stability it appears that a certain amount of resistance is necessary, which may as well be incorporated in the wire of the coil as added separately. It is an advantage to use coils of as large an area as circumstances will permit, as by doing this the ratio area-turns/inductance can be kept up, and larger induced emf's obtained for a given value of the coil inductance. With a pure resistance amplifier as large a value of tuning capacity as possible should be used. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

245. DUNMORE, F. W., "Radio Direction Finding," Pacific Mar. Rev., vol. 19, no. 7, pp. 404-407; July 1922. ABSTRACT: Methods of radio direction finding as aid to navigation; relative advantages of locating finder on shore and on shipboard. (a-3, b-1, c-1, d-5, e-0, f-Evaluation)

246. MORECROFT, J. H., "Resistance and Capacity of Coils at Radio Frequencies," Inst. Radio Eng., Proc. 10, pp. 261-286; Disc. 287-289; August 1922. ABSTRACT: Three methods of measuring the radio-frequency resistance of coils are described:--(1) Alternating-current bridge method; (2) variation of resistance; (3) variation of reactance. In all cases continuous-wave excitation is used, the power source in all the measurements described being a 10-watt valve oscillator. Measurements were made of the variation of resistance of various coils, both of solid and stranded wire, as the frequency was increased from zero to 500,000 cycles. The results are given in

graphical form, and show that the variation does not follow any simple law. The resistance of "tapped" coils was also investigated, as well as the increase of resistance due to the presence of neighbouring coils. The internal capacities of various coils of different shapes were measured, and the effects of the material of the frame or bobbin on which the coils were wound, of moisture, shellac, terminal connections, etc., on the resistance and capacity of coils were investigated. Finally, solid wire and stranded wire are compared at various frequencies, and numerical data are given on the possible resistances obtainable in actual receiving sets. All the results are exhibited graphically. (a-3, b-1, c-1, d-1, e-0, f-Measurements)

247. FRANKLIN, C. S., "Short-Wave Directional Wireless Telegraphy," JIEE, vol. 60, p. 930; 1922. See also Electrician, vol. 88, pp. 593-94; May 1922. ABSTRACT: Reference is made to the early experiments of Hertz with radiation of short wave-length. Marconi's discovery of the increased range with longer wave-lengths took attention away from short wave-length radiation, but the author considers that the more extended use of wireless will necessitate the use of directional aerials to avoid jamming, and for directional work short wave-lengths offer advantages. There are two classes of directional aerial systems: (a) In which the directional properties are nearly independent of the dimensions, as in the frame aerial, and (b) those where directional properties are dependent on aerial dimensions and wave-length, and this group is subdivided into (1) reflector systems, (2) aerials at right angles to working direction and with phase adjustments, and (3) Beverage long receiving aerial. The author has experimented with the reflector system and with Marconi in 1916, worked with wave-lengths of 2 and 3 metres. The only interference was due to irregular disturbances of motor-boat and motor-car magnetos which emit wave-lengths of 0-40 metres. Using a selected crystal detector and reflectors of wire, or strips, arranged in the form of a cylindrical parabola and tuned to the wave, it was found that good directional properties could be obtained with reflectors properly proportioned to the wave-length, but the attenuation over sea was very high and the maximum range was 6 miles. These experiments were continued in 1917 at Carnarvon with a 3-metre wave, and as an outcome it was found there is a very rapid increase of the strength of the electric field with the height above ground, and the rate of increase appears to be a function of the ratio of height to wave-length. The range now obtained was 20 miles when the transmitter was 600 ft above sea-level and receiver 300 ft, but although there was a clear air line the signals increased in strength with height, whilst at sea-level the range was only 4 miles over sea. In 1919 experiments were continued at Carnarvon with valve transmitters to produce a unidirectional telephone system with a 15-metre wave and 200-watt valve transmitter. This gave strong speech at Holyhead, 20 miles distant, and later a range of 70 nautical miles, and it was found there was no diminution in strength after passing the horizon line from Carnarvon. Further experiments were carried out in February, 1921, between Hendon and Birmingham, and good speech received up to 66 miles on a motor-car and fair speech at Birmingham. Later tests between Frankley and Hendon, a distance of 97 miles, employed a 2-valve, 700-watt transmitter. Average measurements indicate that the energy received when both reflectors were used was 200 times that received without the reflectors, and this result contradicts the suggestion that the polar curve taken locally differs from the polar curve taken distantly. In these experiments a duplex telephonic system was used, and whilst trouble occurred due to induction in neighbouring structures, it was noted practically no distortion of speech occurred, and it was proved that wave-lengths of the order of 20 metres are quite capable of providing directive commercial services over considerable ranges and with greater relative secrecy. Further experiments were conducted with reference to position-finding at sea and a working range of 7 nautical miles obtained with an accuracy of 2.8°. These experiments were conducted with a compass arrangement in which different signals were given at different points of the compass, and instead of reading maximum signals the mid-point of occurrence and cessation of signals used. A stop-watch method can also be used, but has disadvantages. In replying to the discussion, the author mentioned the production of 60-cm wave-lengths by a Lecher circuit. (a-3, b-1, c-1, d-5, e-0, f-Thorough experimental study)

248. MARCONI, G., "Radio Telegraphy," Inst. Radio Eng., Proc. 10, pp. 215-238; August 1922. ABSTRACT: The author deals generally with recent developments in radio telegraphy. Reference is made particularly to the use of short electric waves and the use of reflectors; and to the rotating, short wave, directional transmitter at Inchkeith. Such short wave-lengths are quite capable of producing a good and reliable point-to-point directional system for quite considerable distances. (a-3, b-1, c-1, d-1, e-0, f-Review)

249. BELLINI, E., "Frame Aerials and Errors in Bearings," Electrician, vol. 89, pp. 150-151; August 1922. ABSTRACT NO. 1: Some early experiments on elimination of night effect by rotation of the loop on both axes. ABSTRACT NO. 2: Bearings of sending stations obtained by using frame aerials are often wrong, especially on summer nights. In a former article, the author has set forth the hypothesis that these errors are due to the influence of the Heaviside layer. In order to avoid these errors it should, therefore, be sufficient to suppress the reception from the image of the transmitting station with respect to the Heaviside layer, considered as a mirror. This could be obtained by letting the frame turn around a horizontal, as well as round a vertical axis. The errors must disappear when the plane of the frame is at right angles to the direction of the image. The indication that this position is reached should be given by the obtaining of a good zero position. The experiment made verified all the provisions except one. The good zero position was obtained not when the plane of frame was at right angles to the direction of the image, but when this plane was symmetrical to this position with respect to the vertical. No conclusion is drawn from the experiments, but further observations are recommended. (a_1-6, a_2-1, b-1, c-1, d-5, e-0, f-Through experimental study)

250. BREIT, G., "Effective Capacity of Pancake Coil," Phil. Mag., vol. 44, pp. 729-740, October 1922. ABSTRACT: In a former paper, the author has defined the "effective capacity" of an inductance coil, and discussed the conditions of its existence and methods of determining it. He here applies his method to the case of a spiral coil, which he terms a pancake coil. The methods used are frankly approximate, but considered sufficiently accurate for the purpose. His method consists in first computing the distribution of charge on the coil which will satisfy the law assumed for the potential distribution. Then he determines $M(\chi)$, a factor of the integral constituting the effective capacity C_0. This is done for three cases - the coil unearthed and earthed at the centre and at the outer edge. The electrostatic problem is simplified by the use of elliptical coordinates, and the solution obtained in terms of Legendre functions. The remainder is ordinary integration. The results of the calculation are that, expressed in micro-microfarads, the capacity of the coil when earthed at the centre is 0.567 $Ka\mu\mu f$; when earthed at the periphery it is 0.330 $Ka\mu\mu f$; and when insulated it is 0.252 $Ka\mu\mu f$, when a is the radius of the coil and K is the dielectric constant of the medium. The formulae for the earthed capacities is verified on a hexagonally wound spiral, where a is taken as the mean of the radii of the inscribed and escribed circles, the dielectric being air. The calculated and measured values were in each case $16\mu\mu f$ and $9\mu\mu f$ respectively. Measurements were not made more accurately than $1\mu\mu f$ on account of the difficulties connected with such measurements. (a-3, b-1, c-1, d-5, e-0, f-Theory)

251. STOYE, K., "Reception Disturbances of Atmospheric Electric Nature," Jahrb. d. drahtl., vol. 20, pp. 303-305; October 1922. ABSTRACT: Up to the present, atmospheric disturbances have been classified into about 3 classes. As a result of numerous observations in the Rhine neighbourhood in 1915-1917, ten classes were prepared as follows: (1) Prevailing weather type. Strong whistle dwindling to hiss; (2) Mist type - weak hiss; (3) Breaking up of clouds type - groups of crashing types; (4) Cirrus type - "burr" sounds; (5) Lightning type - more pronounced than (4); (6) Squally wind type - growls; (7) Cumulus type - short sharp cracks; (8) Thunderstorm cumulus type - groups of sharp cracks; (9) Sunrise type - continuous energetic scratches and rattling; (10) Sunset type - combination of types (3), (9), and others. Directional observation of certain types were possible, particularly in the case of the thunderstorm types. (a-3, b-1, c-4, d-4, e-0, f-Classification data)

252. MARTI, P., "Radio-Acoustic Methods for Determining the Position of Ships at Sea," Onde Elec., vol. 1, pp. 444-454; November 1922. ABSTRACT NO. 1: Description of an acoustical method of D/F. Radio is used only as a tune reference. ABSTRACT NO. 2: The determination of the position of a ship not too far from land may be found in the following manner. A coast station is equipped with a wireless direction-finding equipment and also with one or more hydrophones situated at known positions on the sea bed and connected by cables to the receiving station. Wireless communication having been established between the ship and the shore station, the ship gives the exact time of the explosion of a suitable depth charge. The shore station notes the time of arrival of the explosion wave at one of the hydrophones and then calculates the distance of the ship from the time interval and the known velocity of sound in sea-water. The direction of the ship is known from the wireless direction-finding apparatus, and so the ship is located. If two hydrophones are used, about 3 or 4 km apart, in conjunction with a time-recording apparatus, the ship's position may be located without the wireless direction-finding gear. It is, of course, necessary to have an exact knowledge of the velocity of sound in sea-

water. A detailed account of an investigation carried out at Cherbourg on the effect of various factors (salinity, temperature, pressure) on the velocity of sound in sea-water has been given in Annales Hydrographiques, 1919-1920. The results obtained give a mean velocity of very nearly 1500 m per sec. The velocity should diminish by 36 m per sec on passing from water of mean salinity to fresh water, and should increase by 2.5 m per sec for an increase of temperature of 1°C. The velocity should increase by 1.5 m per sec for a pressure increase of 10 atm., corresponding approximately to a depth of 100 m. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Qualitative description (Note: Science Abst. dates article as August 1922)

253. MESNY, R., "Variation in Direction and Strength of the Electromagnetic Field of a Transmitter," Onde Elec., vol. 1, pp. 501-517, 577-587; November-December 1922. ABSTRACT NO. 1: Experiments with the diffraction of 10,000 to 25,000 meter waves. The straight-field polarization by day for those waves is changed to an elliptical one by night-effect. Qualitative and quantitative results Comparison with Austin's, and Fuller's formulas. ABSTRACT NO. 2: A prolonged series of observations of the field, direction and intensity has been made for a number of stations, and the results are given in the present paper. Diagrams constitute the chief interest of the paper. Some of these show the variations in direction-finding observations at different times of the day and for different months of the year. Others show the variations in intensity of the emf (in microvolts per metre) produced at Meudon by the stations Lafayette, Nantes and Rome. For details the original paper should be consulted. A.W. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Thorough theoretical analysis)

254. MESNY, R., "Radio Direction-Finding," Annales des Postes, vol. 11, pp. 1240-1263; November-December 1922. See also Science Abstracts, vol. 26, p. 125, 1923. ABSTRACT: This article deals in an elementary manner with the principles of radiogoniometry. After referring to the theory of reception with a frame aerial and the method of the four zeros of reception for determining the direction of propagation of electromagnetic waves, the author explains the dissymmetry introduced in the circuit by the receiving triodes and describes the special condenser for reestablishing the capacity equilibrium of a frame with respect to the earth. The unilateral system is briefly indicated. The errors produced by lack of uniformity in the earth, summer-night errors, and metallic masses of ships are discussed at some length. The author also deals with applications of radiogoniometry to aeroplanes, the Bellini-Tosi system and the Marconi bent aerial. (a-3, b-1, c-3, d-3, e-0, f-Theory)

255. BAUMLER, M., "Simultaneous Occurrence of Atmospherics II," Jahrb. d. drahtl., vol. 20, pp. 456-457; December 1922. From the Telegraphentechn. Reichsamt. ABSTRACT: Analysis of observations of atmospherics made at Hamburg, Strelitz, and Berlin shows that for 100 atmospherics observed at Strelitz, 90 were observed at Hamburg, 69 being simultaneous. For 100 at Strelitz, 318 were observed at Berlin, 93 being simultaneous. In a third series, for 100 observed at Strelitz, 110 were observed at Hamburg and 543 at Berlin, 74 being observed simultaneously at all three places. Discussion of the results leads to the conclusion that the origin of atmospherics observed simultaneously is probably at some considerable distance. See Abstract 822 (1922). (a-3, b-1, c-4, d-4, e-0, f-Experiments)

1923

256. DELLINGER, J. H., WHITTEMORE, L. E., AND KRUSE, S., "A Study of Radio Signal Fading," Bureau of Standards, Sci. Papers, No. 476, pp. 193-230; 1923. ABSTRACT: Fading is defined as rapid variation of signal intensity at constant wave-length during reception, as distinct from "swinging," when the wave-length varies. An example of fading is given. This is most pronounced on short wave-lengths, is small above 400 m, and is most pronounced at night. The increase in the number of short wave transmitters renders investigation necessary and this should be carried out simultaneously by many observers. A scheme of investigation was drawn up in 1920 by the American Radio Relay League and the Bureau of Standards and preliminary tests carried out with 17 sending and 243 receiving stations confined to north-east United States. Transmitting stations were of both spark and valve type, but chiefly 1-kw. 60-cycle, non-synchronous spark sets, at 200 metres wave-length. The recorders were of the "tuned plate regenerative" type, the circuit being illustrated. Details of signals transmitted are given. Various methods of recording signals are considered and the method adopted was aural reception with a standard form of chart to indicate variations of signal strength, weather, etc. Examples are given as to how closely qualitative records agreed, when made independently by two observers on the same instrument. The various tests are then described and the method of analysing the data, curves being given to illustrate "traveling," "similar," and "inverse" curves. The analysis was conducted by means of a tabulating machine. Results are given as regards: (1) Wave-length, (2) barometric conditions on transmission, (3) barometric gradient on signal strength, (4) temperature gradient on signal strength, (5) temperature gradient on fading, (6) effect of clouds on fading, (7) effect of clouds on signal strength, (8) effect of clouds on intensities of strays, (9) occurrence of various degrees of fading, (10) fading and nearby wire lines. Theories of fading are then considered. The structure and boundaries of the atmosphere are (a) earth's surface, (b) troposphere (10 km in height), (c) a radio-active layer which is not, however, well established, (d) stratosphere, or isothermal layer, ionised in sunlight only, (e) permanently ionised conducting Heaviside layer, the boundary of which varies and which is the region of permanent aurora. In daylight transmission the waves cannot reach the Heaviside layer, because of the ionised stratosphere and they travel along the earth's surface and are absorbed there. At night the waves reach the Heaviside layer and travel without appreciable absorption, but because of irregularities of the Heaviside surface the waves may vary rapidly in intensity. It was shown intensities varied from (a) no absorption, (b) absorption as present during daylight. The inference is drawn that the parts of the wave which travels along the Heaviside layer is either completely absorbed or completely unabsorbed, and in the former case the conditions are similar to the daylight propagation. Within a distance in which absorption at the earth's surface is negligible there is no fading and day and night intensities are equal. Other theories are considered, such as those of reflection and interference and changes in direction of propagation of the waves. Tests have shown the latter to be negligible. (a-3, b-1, c-1, d-1, e-0, f-Experiments)

257. KEEN, R., Some Polar Diagrams of Reception for Systems of Spaced Aerials, Yearbook of W.-T., p. 823; 1923. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

258. DUNMORE, F. W., AND ENGEL, F. H., "Directive Radio Transmission on a Wave-Length of 10 Metres," Bureau of Standards, Sci. Papers, no. 469, pp. 1-16; 1923. ABSTRACT: Reference is made to Marconi's recent work on short wave-length transmission and the advantages of short waves for directive work. The authors have experimented on a 10-m. wave-length using at the transmitting end a parabolic cylindrical reflector. The apparatus is described in great detail, with dimensions to enable other investigators to continue the experiments. The transmitter was a 50-watt tube of the coated filament type, inductively coupled to a balanced aerial and counterpoise. This was placed at the focus of a grid parabolic reflector, each wire of which was tuned to 10 metres. The focal distance was 1/4 of the wave-length. The radiative properties of this reflector are discussed in detail. The receiving apparatus was a 3-valve instrument coupled to a frame aerial capable of orientation, and intensities of signals were quantitatively recorded by means of a thermocouple. The results obtained, under various conditions with fixed receiver and rotated transmitter, are shown by polar diagrams. These demonstrate the effect of detuning and tuning each wire of the reflector, effect of increasing the reflector aperture, effect of removing alternate wires, and effect of increasing the wires. The results show a remarkable directive action, and the conditions of directional working are: (1) The source of waves should be exactly at the focus, (2) the reflecting wires should be in resonance with the source, (3) the width of reflected wave front is dependent on the size of the aperture. Further experiments on the reflective action of buildings, with most pronounced effect, are detailed. With a heterodyne receiver experiments were conducted over a distance of 2 miles, and it was remarked that strays were not heard at all on this small wave-length. Telephony experiments were also conducted. (a-3, b-1, c-1, d-1, e-0, f-Experiment, diagram of antenna in original a-3 abstract)

259. STENZEL, H., "The Error Angle in Wireless Position Finding," Jahrb. d. Draht, vol. 12, p. 221; 1923. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

260. WOOD, A. B., AND BROWNE, H. E., "Radio-Acoustic Marine Direction-Finding," Proc. Phys. Soc., vol. 35, pp. 183-189; 1923. ABSTRACT: A description of a means of locating the position of a ship at sea by the emission of a radio "dash" simultaneously with the firing of a small charge in the sea. A station on shore records the arrival of the radio signal, and also of the explosion wave at a number of hydrophones suitably disposed in known positions on the sea bed. The times of travel of the explosion wave, and hence the distances from the charge to each hydrophone, are indicated by an Eithoven galvanometer photographic recorder. (a-6, b-1, c-1, d-5, e-0, f-Experiment)

261. ROTHÉ, E., "Radiogoniometry of Atmospheric Eddies and Weather Prognostication," Onde Electrique, vol. 2, no. 13, pp. 7-18; January 1923. ABSTRACT: Different types of eddies or discharges; following or recording thunder storms by radio; examples of storm records. (a-3, b-1, c-3, d-3, e-0, f-Goniometry)

262. WATSON-WATT, R. A., "Directional Observations of Atmospheric Disturbances," Proc. Roy. Soc., vol. 102, ser. A, pp. 460-478; January 1923. See also Phil. Mag., vol. 45, Ser. pp. 1010-1026;May 1923. ABSTRACT: Experimental data establishing the diurnal and seasonal variations of the apparent direction of arrival of atmospherics. (a-6, b-1, c-1, d-5, e-0, f-Experimental study)

263. SMITH-ROSE, R. L., AND BARFIELD, R. H., "The Effects of Local Conditions on Radio Direction Finding," JIEE, vol. 61, pp. 179-191; disc., 191-196; January 1923. ABSTRACT: Direction finding errors related to the presence of telephone lines are reviewed. An account of experiments carried out by the Sub-Committee of the Radio Research Board on wireless direction finding, to determine the errors which are produced by the immediate surroundings of the installation. The experiments, which are made with a direction finder of the Robinson type, provide quantitative data as regards the effect of metalwork, coils, aerials, overhead wire, and trees situated in the immediate vicinity. The effect of buildings and mountains is also measured. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

264. HEILIGATAG, T., "Causes of Errors in Direction Finding," Jahrb. d. Draht., vol. 21, p. 77; 1923. ABSTRACT: An investigation is made of the directive effect with a frame aerial influenced by two waves of the same frequency, but with different directions, intensities, and phases. The results lead to an explanation of errors, such as false directions or spurious minima, observed in frame coil direction finding. (a-3, b-1, c-4, d-4, e-0, f-Theory)

265. ECKERSLEY, P. P., "Effective Heights of Aerials," Electrician, vol. 90, pp. 134-135; 9 February 1923. ABSTRACT: Reviews the work of Vallauri, Pession, and Sommerfeld on this subject. (a-3, b-1, c-1, d-5, e-0, f-Review)

266. ECCLES, W. H., "Atmospherics and Methods of Signalling," Wireless World and Radio Rev., vol. 11, pp. 662-665; 17 February 1923. ABSTRACT: This is a presidential address to the Radio Society of Great Britain. After giving an account of the present position in regard to atmospherics, the author suggests that possibly better results might be obtained by departing from the Morse code and employing instead (1) two notes, or (2) three notes, the intermediate one being maintained constantly, or (3) chords, so as to obtain vowel sounds. (a-3, b-2, c-1, d-5, e-0, f-Proposal)

267. BEVERAGE, H. H., Rice, C. W., AND KELLOGG, E. W., "The Wave Antenna (Beverage Antenna)," AIEE, vol. 42, pp. 258-269, March: 372-381; April: 510-519, 636-644; June: and pp. 728-738; July 1923. ABSTRACT: The present paper deals with the wave antenna which has not only marked a distinct advance in the reduction of interference and "static," but because of its aperiodic nature and effectiveness as an energy collector, has made possible the simultaneous reception of a large number of messages by one antenna, and the automatic relaying of the messages over land wires. The use of two wires is not an essential feature of the wave antenna but permits flexibility in the location of the receiving station. In its elementary form the wave antenna consists of a straight horizontal conductor of the order of a wave-length long, parallel to the direction of propagation of the desired signal, with the receiving circuit located at the end farthest from the sending station and with the end nearest the sending station grounded through a resistance of the proper value to practically prevent reflections. Under these conditions the desired signal waves produce comparatively feeble currents at the end nearest the sending station and strong currents at the receiver end, while disturbances coming from the opposite direction cause feeble currents at the receiver end and strong currents at the end farthest from the receiver (nearest the transmitting station). This comparative immunity of the receiving set to disturbances coming from a direction opposite to the desired signal is lost if reflections are permitted to occur at the end farthest from the receiver. The growth of current in the direction of travel of the space wave depends on the velocity of propagation of waves on the antenna in comparison with the velocity of the space waves, the received current being strongest if the two are equal. If the characteristic wave velocity on the antenna is less than that of the space waves (or less than the velocity of light) increasing the length of the antenna increases the received current up to a certain point, after which further increase in antenna length reduces the received current. The length for maximum signal depends on the velocity ratio and wavelength. The slower the antenna or the shorter the wavelength received the shorter the length for maximum signal. It is very frequently the case, however, that the best directive properties are obtained with an antenna longer than that which gives the strongest signal. The effect of the space wave is to produce in the wire a signal frequency electromotive force which affects the different parts of the antenna progressively as the space wave passes over the line. On this basis the received current can be calculated in terms of the frequency and intensity of the induced electromotive force, the direction of the space waves and the length and electrical constants of the antenna. By assuming the direction to be changed while all other factors remain the same, and calculating the relative value of received current for various directions of signal wave, we can determine the directive properties of the antenna. The result is best shown by means of a polar directive curve. Directive curves are given which bring out the effects of antenna length, relative to the wavelength, velocity of propagation, and line attenuation. In general, it is found that moderate line losses are not appreciably detrimental to the directive properties of the antennas, while the fact that velocities obtainable with unloaded lines are materially below that of light, results in an actual improvement in directive properties in most cases. As a rule the longer the antenna the sharper its directive curve. While it is possible to obtain fair directive properties with antennas less than a half wavelength long, this length is considered about the shortest that can be recommended. By a process of balancing, it is possible to produce a "blind spot" or direction of zero reception, at any angle more than 90degrees from the signal. One method of obtaining this result is by producing reflections of certain phase and intensity at the end opposite to the receiver. Reflections at the receiver end of the antenna, on the other hand, do not alter the directive properties of the antenna. Data on wave velocity and line losses on an existing antenna can be obtained by means of a radio frequency oscillator and one or two hot-wire milliammeters. Measurements taken by the writers show much higher attenuation and lower velocities for ground return circuits than for metallic circuits. The mean depth of return currents at the longer radio wave lengths appear to be of the order of several hundred feet. The more wires in multiple in the antenna, the lower the velocity and the higher the rate of attenuation. Reduction of atmospheric disturbances or "static," has probably received more attention from experimenters than any other one phase of radio reception. Of the various lines of attack none has been more fruitful than the employment of directive receiving systems. Every increase in directivity has resulted in an improvement in stray ratio. Conditions on the eastern coast of North America are especially favorable for taking advantage of differences in direction, for the European stations are to the northeast while the predominating direction of static is from the southwest. Various practical engineering problems in connection with the wave antenna, including its application to short wave reception, are discussed toward the close of the paper. (a-1 and a-4, b-1, c-1, d-1, e-423, f-The classic paper on Beverage antennas)

268. STENZEL, H., "The Error Triangle in Wireless Position Finding," Jahrb. d. drahtl., vol. 12, pp. 221-229; April 1923. ABSTRACT: If the position of a ship is determined by taking bearings on three transmitting stations, the direction lines will not meet in a point because of the errors in the directions. The intersections form a triangle, and the object of the paper is to show how to find the most probable position of the ship by means of the method of least squares. The properties of the desired point are investigated; it is shown that in every triangle there is one and only one such point, and a graphical construction for its determination is described. (a-3, b-1, c-4, d-4, e-0, f-Theory)

269. MESNY, R., "Compensation of Radiogoniometer Coils," Rev. Gen. d'El., vol. 13, pp. 773-780; May 1923. ABSTRACT: An explanation is given of the nature of the dissymmetry introduced into coils used for D/F work not only by the apparatus connected to them but also by the emf's applied to the coils. The author establishes the general equations for a coil employed as a goniometer. The paper concludes by a study of the compensation of a turning field, and of the modifications which should be applied to a coil when the waves reaching it are elliptically polarized. (a-6, b-1, c-3, d-3, e-0, f-Theory)

270. BRILLOUIN, M., "Possibilities of Wave Propagation Studies with Models," Comptes Rendus, vol. 176, pp. 1776-1779; June 1923. ABSTRACT: The qualities of a good model are discussed. The lengths x, y, and z, the time, t, and the resistivity, e, should be modified in the same ratio. The dielectric constant and the magnetic permeability remain the same, but the conductivity must be modified; if the model is 1/1000 scale, the conductivity must be multiplied by 1000 and the conductibility of the atmosphere, depending on the number of ions, must be multiplied by 1000. The Heaviside layer can be made with a

metallic screen. The terrestrial magnetism and the motion of the air do not have to be changed. (a-6, b-1, c-3, d-3, e-0, f-Theory)

271. BUSCH, H., "Theory of the Beverage Antenna," Jahrb. d drahtl., vol. 21, pp. 290-312; May, and pp. 374-390; June 1923. ABSTRACT: In the first part of this paper theory is given relative to the use of the Beverage antenna, for receiving waves in the direction of its length. The second part considers the behaviour of such antennae for waves coming in any direction, and discusses the directive properties. It is shown that for a horizontal antenna in which end reflection is hindered by a suitable end resistance, the potential amplitude increases approximately in direct proportion to the distance from the earthed end, providing that the damping is small and the propagation velocity along the wire is equal to that of light. If the length is of the same order of magnitude as, or greater than, the wave-length of the received waves, the end potential is practically independent of the arrangements at the initial point, which may be earthed direct, or through a resistance, or may even be insulated without making much difference to the end potential. The condition for suppression of end reflection is found not to be same as given by the ordinary theory for infinitely long cables. Formulae are deduced for the end resistance. The energy collected from the incoming wave by a Beverage antenna is shown to be proportional to the square of the antenna length, inversely proportional to the square of the wave-length, and for short waves is of the same order as that of a high antenna. Polar diagrams are given illustrative of the directive effects under various conditions. When the antenna length l is a large multiple of the wave-length, signals are only received through a small angle α on either side of the line of the antenna. Outside this angle practically nothing is received. The angle is approximately inversely proportional to $\sqrt{(l/\lambda)}$ and is, for $l/\lambda = 10$, about 25°, for $l/\lambda = 20$, only about 18°. (a-3, b-1, c-4, d-4, e-0, f-Theory)

272. CHANDLER, C. K., "Directional Wireless Telegraphy in Aircraft," JIEE, vol. 61, pp. 803-811; July 1923. ABSTRACT: A short description of aircraft D/F equipment is given, and the errors which arise are considered. Some of the errors are traced to currents in the bracing wires of the plane and to lack of good connections between bracing wires and struts. Calibration errors introduced when the plane is calibrated on the ground are discussed. (a-6, b-1, c-1, d-5, e-0, f-Theory and analysis of results)

273. BOUTHILLON, L., "Wave Propagation," Onde Elec., vol. 2, pp. 275-289, 345-357; July, August 1923. ABSTRACT: As far as wave propagation is concerned, the ocean may be considered as a perfect conductor; one must take into account the conductivity and dielectric constant of the ground. One must appeal to an atmospheric ionization to explain the propagation phenomena. Watson's and Eccles' theories given. (a-6, b-1, c-3, d-3, e-0, f-Theoretical analysis)

274. ZEH, G. H., "The Kolster Radio Compass," Pac. Mar. Rev., vol. 20, no. 7, pp. 329-331; July 1923. ABSTRACT: Design of compass and its application. (a-3, b-1, c-1, d-5, e-0, f-Description)

275. AUSTIN, L. W., "Loop Unidirectional Receiving Circuits for the Determination of the Direction of Atmospheric Disturbances," Proc. IRE, vol. 11, pp. 395-397; August 1923. ABSTRACT NO. 1: Describes the use of a balancing antenna, inductively coupled to a loop for quadrature balancing. ABSTRACT NO. 2: Details are given of an apparatus for determining the direction of atmospherics, consisting of a balanced and a loop aerial with a commutator switch, so that the loop aerial may be oriented to give equal intensity of signals on either position of the commutator. The author states that this method is more accurate than that of a simple unbalanced radio compass loop. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Experimental)

276. ANONYMOUS, "The Kolster Radio Compass," Pac. Mar. Rev., vol. 20, no. 9, pp. 415-418; September 1923. ABSTRACT: Practical navigating unit developed by Federal Telegraph Co., of California under personal supervision of Dr. F. A. Kolster. (a-3, b-1, c-1, d-5, e-0, f-Description)

277. HORTON, C. E., "Wireless Direction-Finding in Steel Ships," JIEE, vol. 61, p. 1049; 1923. ABSTRACT: The advantages of position-finding work being carried out upon the ship itself instead of by special shore stations are discussed in favour of the first method. A very interesting section then deals in detail with the calibration of the direction finder, both practically and theoretically, as regards secondary deviations due to masts, funnels, stays, etc. The effect of wavelength is also considered and then the effects of neighbouring aerials, where, as on a man-of-war, there are multiple aerials. Means of reducing inductive fields by relative arrangements of the direction-finding aerials as regards funnels are then described. A very neat laboratory method of ascertaining the minimum position of deviation in any given case is given. Briefly this consists in passing a steady current through a large sheet of zinc in which holes are cut to represent the relative disturbances of water, guns, etc., and the position is found where the flow of current is most uniform, which is similar to the case of alternating wireless currents. Limitations of the analogy are mentioned and the actual method of measuring the angle of deviation is illustrated. Final sections deal with methods of correcting deviations, the disposition of the direction-finding office, and the use of an automatic compass repeater to give the true bearing of the vessel. A very extended discussion followed. (a-3, b-1, c-1, d-5, e-0, f-Theory)

278. SMITH-ROSE, R. L., AND BARFIELD, R. H., "A Discussion of the Practical Systems of Direction-Finding by Reception," R. R. B. Spec. Rpt. No. 1, H. M. Stationery Office; 1923. See also Engineering, vol. 116, p. 305; 1923. ABSTRACT: This article is an abstract of Radio Research Board Special Report No. 1, which is entitled: "A Discussion of the Practical Systems of Direction Finding by Reception." The Bellini-Tosi, single loop, and Robinson systems are compared experimentally and shown to give substantially the same results, each of the three systems having, however, its own special conveniences, either in operation or construction. (a-3, b-3, c-1, d-5, e-0, f-Experimental comparison)

279. MACCALLUM, H., "Wireless Direction-Finders," Times Trade & Eng. Supp., vol. 13, no. 271, p. 13, September 15, 1923. ABSTRACT: Theory and apparatus. (a-3, b-2, c-1, d-0, e-0, f-Theory)

280. SLEE, J. A., "Developments in Wireless Telegraphy," Engineering, 116, pp. 410-411; 28 September 1923. Paper read before British Assoc., Liverpool, 1923. ABSTRACT: In this paper the author deals briefly with the main advances in commercial marine wireless telegraphy that have taken place in the last year or so. The large trans-Atlantic liners are now fitted with high-speed c. w. transmitters and automatic recorders. In the transmitter the keying is performed on the aerial coupling, a resistance being connected in circuit when the key is up to maintain a constant load on the value. The receiver uses, both HF and LF amplification, the latter being tuned and so forming a note filter. The recorder used is of the MacLachlan type. Another notable development is the use of short-wave (6 metres) rotating beam stations. The signals from these stations have a range of about ten miles, and are detected by special receivers mounted actually on the ends of the ship's bridge. The revolving beam is obtained by mounting the transmitter in a special parabolic reflector system which is suitably rotated. A contact finger is arranged so that a special signal is emitted at every two points of the compass. Reference is also made to the improved results now being obtained with the standard ship's D/F set; and some promise is given of a duplex telephony set for ship to shore service, working in conjunction with P. O. telephone exchange system. (a-3, b-1, c-1, d-5, e-0, f-Theory)

281. ANONYMOUS, "Portable Submarine Direction Finder and Sounder Devised for Small Vessels," Mar. News, vol. 10, no. 6, pp. 76 and 84; November 1923. ABSTRACT: Portable submarine direction finder and submarine sounder suitable for installation on lifeboats, yachts and fishing vessels. (a-3, b-2, c-1, d-0, e-0, f-Description)

282. ANONYMOUS, "Radio Direction Finding by Reception," Nature, vol. 112, no 2819, pp. 690-692; November 10, 1923. ABSTRACT: Discusses three principal systems of direction finding, namely, Bellini-Tosi, single-frame, and Robinson system. (a-3, b-1, c-1, d-5, e-0, f-Description)

283. MESNY, R., "Radiation from A Loop," Onde Elec., vol. 2, p. 571; December 1923. ABSTRACT NO. 1: By means of a potential vector, expressions are derived for the electric and magnetic fields of a loop. The mutual action of two loops and the resulting errors are discussed. ABSTRACT NO. 2: It is sometimes necessary to arrange several frame aerials in a confined space and the question of their mutual interference becomes of importance. Neither the usual radiation formulae for large distances nor the mutual inductance calculations for small distances give the desired information. The author derives mathematically expressions for the electric and magnetic field which apply to all distances, provided only that the square of the dimensions of the frame is small compared with the distance at which the fields are

estimated. The formulae obtained are used to find the reactions of two frames upon each other, and in the case where one of the frames is used for direction-finding, the error to be expected when the frames are various distances apart is found, and it is shown that when the frames are tuned they should be separated by at least 30 metres. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

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284. ANONYMOUS, "Deviation Shift Due to Sand Movements on Beach," U.S. Navy Dept. RG 2A 261; 1924. ABSTRACT: Direction finding site errors due to shifting sand dunes are described. (a-4, b-3, c-1, d-1, e-0, f-Experimental results)

285. BROWN, O. F., "The Heaviside Layer and How It May Be Produced," Exper. Wireless, vol. 1, p. 595; 1924. ABSTRACT: Not available. (a-4, b-2, c-1, d-5, e-0, f-0)

286. CHANDLER, C. K., Discussion on "Directional Wireless Telegraphy in Aircraft," JIEE, vol. 62, p. 129; 1924. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

287. ENGEL, F. H. AND DUNMORE, F. W., "Directive Type Radio Beacon," Bureau of Standards, Sci. Papers No. 480, pp. 281-295, 1924. ABSTRACT: This paper deals with a method of guiding a ship or aeroplane by means of radio signals sent from a particular type of radio beacon. The crossed-coil antenna directive radio beacon consists of two coil antennae crossed at an angle of about 135° with respect to each other, signals being transmitted alternately from each coil antenna. Waves are thus intermittenly propagated directively from each coil, the intensity of the emitted wave with respect to the plane of each coil varying in accordance with a figure-of-eight. A receiving set located anywhere on the line bisecting the angle between the two coils alternately receives signals from each coil. The intensity of the signals is the same. At any point not on the bisector of the angle between the two coils signals of unequal intensity are received, the difference in intensity depending on the location of the receiving set. When used for beacon purposes, an aircraft or ship equipped with the ordinary type of receiving set may keep on a direct line to the beacon by navigating so that the signal strength from the two coils remains equal. The apparatus used is described and an account of its experimental development given. Results of actual tests, both on ship and on an aeroplane, are given. On one test, at a distance of about 35 miles from the beacon, there was found to be a zone of equi-signals a mile wide, in which sector no noticable difference in intensity in the signals received from the two coils could be observed. Outside this sector, however, the two signals were noticably unequal in intensity. The point is made that while this aid to navigation may be effective only over definite courses it has the advantage over other methods that no special receiving apparatus is necessary, and that it gives an immediate indication of any alteration in the course caused by drift from wind or tide. (a-3, b-1, c-1, d-1, e-0, f-Theory)

288. HECK, N. H., ECKHARDT, E. A., AND KEISER, M., "Radio Acoustic Method of Position Finding in Hydrographic Surveys," U.S. Coast & Geodetic Survey, Special Publication no. 107, Serial no. 277; 1924. ABSTRACT: Discusses hydrographic problem and installation details. Describes apparatus and method of operation. (a-3, b-3, c-1, d-1, e-0, f-Description)

289. HOWE, G. W. O., "The Overworked Heaviside Layer Problem and a Possible Alternative," Electrician, vol. 92, p. 720; 1924. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

290. KEISER, M., AND ECKHARDT, E. A., "Position Finding in Hydrography by a Radio-Acoustic Method," Phys. Rev., vol. 23, p. 785; 1924. ABSTRACT: The distance between two points is determinable by starting sound and radio signals at one and observing the time interval between their arrivals at the other. No appreciable error results in assuming the arrival and departure times of the radio signal to coincide. The distance is determined by multiplying the observed time by the sound velocity. A ship making depth soundings to be used in the preparation of hydrographic maps uses auxiliary shore stations. The ship is equipped for recording radio signals on a chronograph drum and for transmitting sound signals. At each shore station a hydroplane receives the sound signal and auxiliary apparatus provides for the automatic transmission of radio signals as a result thereof. The ship records the instant of firing a bomb as well as those at which the radio signals from the shore stations arrive. The travel times of the sound through the water from ship to each shore station are read from the chronograph chart. They are corrected for the lags which are currently determined. The combination of the computed distances gives the position of the ship on the chart. The operations of the ship are therefore independent of visibility. This work was done in cooperation with the U.S. Coast and Geodetic Surveys. (a-3, b-1, c-1, d-5, e-0, f-0)

291. SCHADE, O., "Transatlantic Reception on a Frame Aerial," Zeits. f. Hochfrequenztechnik, vol. 23, 4-5, pp. 78-79; 1924. ABSTRACT: This article describes a receiver for receiving and recording the signals from New Brunswick (North America), the receiver being at Elberfeld in Germany. The aerial is a metre-square frame wound with thirty turns of wire. A photograph and a diagram of the circuit are given. The receiver consists of seven four-electrode valves, no technical description of the circuits given. (a-3, b-1, c-4, d-4, e-0, f-Description of experiment)

292. SEYMOUR, C., AND HORTON, C. E., "Compensation of Errors in Direction Finders," Exper. Wireless, vol. 1, p. 64; 1924. ABSTRACT: Not available. (a-4, b-2, c-1, d-5, e-0, f-0)

293. SMITH-ROSE, R. L., The Reliability of Radio Direction-Finding for Navigational Purposes, Year Book of W. T., p. 585; 1924. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

294. STOYE, K., "Wireless Telegraphy and Atmospheric Conditions," Zeits. f. Hochfrequenztechn., 23, 6, pp. 87-88; 1924. ABSTRACT: In a previous paper, the author showed that there was a definite connection between atmospheric conditions and errors in direction-finding and diminution in the intensity of received signals. In the present paper the results obtained by various observers are shown to confirm the author's results. Other results show a connection between direction-finding errors and atmospherics of the "click" type. Sunspots also appear to have an effect. (a-3, b-1, c-4, d-4, e-0, f-Theory and experiment)

295. ANONYMOUS, "D-f in the Navy," Radio Electricite, vol. 5, pp. 15-16; January 1924. ABSTRACT: Experimental results showing that the bearings given by coastal stations are erroneous most of the time. The result is much better if the indicating apparatus is placed on the ship. (a-6, b-2, c-3, d-3, e-0, f-Theory and Experiment)

296. ECKERSLEY, T. L., "Beverage Antenna," Electrician, vol. 92, pp. 39-41; 11 January 1924. ABSTRACT: This paper gives a simple explanation of the properties and operation of the Beverage antenna. Polar diagrams illustrating the directive properties of the one wave-length and the two wave-length Beverage antenna are given. (a-3, b-1, c-1, d-5, e-0, f-Theory)

297. FRANCK, P., "Direction-Finding on Aeroplanes," Onde Elec., vol. 3, pp. 65-69; February 1924. ABSTRACT: Description of and data on an experiment with a radiogoniometer in an aircraft. An account of experiments carried out with a rotating coil fixed in a Goliath aeroplane. As a result of the observations made on a series of flights a certain error has been observed. This systematic error seems to be due to the transmitting station, as it is observed to be reduced to zero when the aeroplane is in such a position as to be in line with the aerial at the station. After allowing for the quadrantal error due to the structure of the aeroplane, an accuracy of about 5 degrees is said to be attained. (a-3, b-1, c-3, d-3, e-0, f-Qualitative experiments)

298. BEDEAU, M. F., "The Beverage Antenna," Onde Elec., vol. 3, p. 86; January 1924. ABSTRACT: An account, mainly mathematical, of the operation of the Beverage Antenna, based upon the series of articles appearing in the Journal of the American Institute of Electrical Engineers between March and July 1923. (a-3, b-1, c-3, d-3, e-0, f-Theory)

299. PAYNE, E. A., "The Radio Equipment of the Steam Yacht 'Elettra'," Inst. Radio Eng., Proc., 12, pp. 9-27; February 1924. ABSTRACT: Gives a detailed description of this vessel, originally named the Rovenska, with particulars of the steering-gear, etc. The vessel is now the pleasure yacht of Signor Marconi, and comprises a very complete wireless equipment, both for telephony and telegraphy, with wireless compass. The vessel was originally fitted with a Telefunken installation, and the quenched spark method appears to have been retained for the main transmitter. The receiving apparatus is dealt with in detail. Many half-tones and line drawings of connections are given. (a-3, b-1, c-1, d-1, e-0, f-Equipment description of historical interest)

300. BUREAU, R., "Meteorology and Atmospherics," Comptes Rendus, vol. 178, pp. 556-558;4 February 1924. ABSTRACT: A comparison of radiogoniometric measurements of atmospherics with corresponding meteorological data appears to show that atmospherics seem to come from regions over which is passing a mass of fresh polar air, and that atmospherics are noticably increased when the mass of air passes over high mountains such as the Alps. Instances are given of the occurrence of such conditions. The observations tend to show that the production of certain atmospherics is favoured by the rapid evaporation of snow fields situated at high altitudes and with an air temperature lower than the melting-point. On the other hand, the apparent variations of direction of atmospherics with the time of year, the hour of the day, and the geographic situation of the observation posts, seem to indicate an action of the sun's rays on the snow layers at high altitudes. (a-3, b-1, c-3, d-3, e-0, f-Experiments)

301. MEDLAM, W. B., AND SCHWALD, A. O., "An Improvement in Frame Aerial Connections," Wireless World, vol. 13, pp. 669-673; February 1924. ABSTRACT NO. 1: This article treats the subject multi-turn; loop antennas in which the correct number of turns for a specific frequency range are furnished by taps. In this case the turns ratio between the used and dead-end turns has a large effect on the pick-up. Also, practical methods of obtaining balanced input-to-ground capacities on balanced (loop) input systems are briefly discussed. ABSTRACT NO. 2: This paper describes an investigation into the effect of "dead-end" turns on the efficiency of a frame aerial. It is shown that if the natural wave-length of the dead-end turns is the same as that of the tuned portion of the coil, then a considerable increase of signal strength is obtained. An extension of this consideration leads to an arrangement in which the whole coil is tuned with a variable condenser in the usual manner while the receiver is connected across a portion of the coil only. The authors state that by this means the signal strength may be increased some two or three times, and further that this system of connections gives greater stability with sensitive amplifiers or reflex circuits. With the grid of the receiver connected to one end of the coil the best position for the filament connection is found to be at that point of the coil which is at earth potential. This is usually rather nearer the grid connection than the middle of the coil. The effect is explained as being due to the various capacities to earth of the coil, receiver, and its associated batteries. (a_1-6, a_2-3, b-2, c-1, d-5, e-0, f-Experiment)

302. BARFIELD, R. H., "Some Experiments on the Screening of Radio Receiving Apparatus," JIEE, vol. 62, pp. 249-264; March 1924. ABSTRACT NO. 1: The chief object of the investigation was to obtain quantitative information on the effect of screens, of which the dimensions are small compared with the wave-length of the waves they are intended to screen. Some preliminary experiments are described, in the first of which the screening effect of a totally closed iron tank was investigated by an operator inside it with a frame coil receiver; and in the second an investigation was made on the effect of screening a square frame receiving coil by totally enclosing each of its four sides in a metallic envelope. A description is then given of the method employed in subsequent experiments of measuring the effect of screens based upon the employment of two receiving coils connected in opposition. This is followed by an account of measurements made by this method on some specially constructed screens of straight wires, open and closed loops, and wire-netting, etc. These measurements demonstrate the important part played by close circuits in screening the magnetic field of radio waves, and show that an effective screen may be constructed of wire-netting. In this connection a description is given of the screening of the interior of a hut with this material to protect direction-finding apparatus within it from "direct pick-up." Further experiments, in which the effect of screens on the electric field of the waves is measured, are then described. Three types of screen investigated were shown to reduce substantially the electric field without affecting the magnetic field, while, later in the paper, it is shown that a fourth type will screen the magnetic field but not the electric field. A cage of the former type is then described which is now in practical use as a means of eliminating "antenna" effect from a single-coil direction-finder contained within it. A discussion of the experiments follows, some explanation of the various effects being given, and conclusions are drawn as to the general principles of screening and as to the essential points to be attended to in the design of efficient screens for various purposes. ABSTRACT NO. 2: Contains descriptions of experimental shielded loops using both cages and conventional gapped screens. Comments by others at end of paper suggest earlier attempts with shipboard D/F antennas. The paper describes a so-called magnetic field screen. (a_1-1, a_2-4, b-1, c-1, d-5, e-710, f-Probably the first suggestion of the screened loop)

303. ANONYMOUS, "Direction-Finding," Exper. Wireless, vol. 1, pp. 487-490, 551-554; May 1924. ABSTRACT: A report on the standing of D/F for navigation in the British Merchant Marine as of 1924. Has a good simple summary of errors and general shipboard techniques used up to that date. (a-6, b-2, c-1, d-5, e-0, f-Description)

304. BELLINI, E., "A New Radio Direction Finder with Sense Finder," Onde Elec., vol. 3, p. 233; May 1924. ABSTRACT NO. 1: A description of the first Bellini-Tosi and of the new Bellini systems. The vertical antenna effect of the loop is used for determining sense. ABSTRACT NO. 2: The paper opens with a general discussion of the problem of marine direction-finding, with particular reference to the methods available for removing the 180° ambiguity which is present in the usual systems. The particular problem to be solved was the design of an installation suitable for ships, the apparatus to be free from the usual 180° ambiguity. Owning to considerations of restriction of space and the need for sturdy construction and general convenience the author decided to adopt the single-coil system, making use of the aerial effect of the coil in order to obtain the cardioid form of polar diagram. In the ordinary way the signal due to the aerial effect is too weak in comparison to that due to the coil proper. In order to increase the potential available to operate the amplifier due to this aerial effect the following special arrangement is used: The grid of the amplifier is connected as usual to one side of the coil tuning condenser. The other side of the coil tuning condenser, however, is earthed through a small capacity condenser (0.0015μF), the filament of the amplifier being connected to the earth side of this small condenser. The aerial effect of the coil is with this arrangement found to be too strong, and to control this the author makes use of the idea of earthing the top of the coil through a variable resistance. The mathematical theory of the arrangement is given in the appendix; it is there shown that the value of the earthing resistance approaches infinity as the coil resistance approaches zero. The existing apparatus has been designed to cover a wave-length range of from 300 to 1000 metres, and is stated to have a daylight range of 750 miles from ordinary stations. Some thirty of these apparatus have already been installed, and a similar number are in course of construction by the Société Francaise Radio-électrique. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

305. SLEE, J. A., "Development of the Bellini-Tosi System of Direction-Finding in the British Mercantile Marine," JIEE, vol. 62, pp. 543-557; June 1924. ABSTRACT: This paper deals with the various sources of error which have been encountered during the development of the Bellini-Tosi system of radio direction-finding as applied to the British Mercantile Marine. The system employed on ships makes use of untuned loops, owing to the easier working and reduction of quadrantal error thereby. The author recognises six errors: (a) calibration error, usually termed quadrantal error, (b) loop-tuning error, (c) lack-of-symmetry error, (d) plain tuning error, (e) electrostatic error, (f) coupling error. These are all considered and the methods of correction indicated. The actual installation of the aerials is described along with three illustrations of ships fitted. A table showing the results obtained is given; about 91% of the bearings observed are found to be correct. All the results have been obtained with spark stations. In the Discussion, L. Bainbridge-Bell and R. L. Smith-Rose comment on the complication and number of sources of error in this system in contrast to the simplicity of the single and crossed-coil systems. R. L. Smith-Rose gives a table of the results obtained by five of the Radio Research Board stations, showing that, contrary to the author's statement, quite good bearings may be obtained of C. W. stations by the crossed-coil method; he suggests that instrumental errors are more difficult to deal with in the case of observation of C. W. stations owing to the use of a local oscillator. R. Keen deals with the night effect in the case of continuous waves, and gives an explanation on the basis of T. L. Eckersley's theory, and concludes by suggesting that very extensive trials are neccessary before continuous wave beacon stations can be safely used. (a-3, b-1, c-1, d-5, e-0, f-Review, theory, and experiment)

306. ROBINSON, J., "Wireless Navigation," Journ. Roy. Soc. Arts, vol. 72, pp. 516-520; Disc. 526-531; 20 June 1924. ABSTRACT NO. 1: The loop system, Bellini-Tosi system, Robinson system, and directional antenna systems in use at that time are described and examples of the use of these various methods given. ABSTRACT NO. 2: The author gives a general account of the applications of wireless direction-finding during the late war and the various methods available. Information is given of the Marconi wireless beam method and a later method used in the R.A.F., which is in effect a Telefunken compass arrangement in which the external directional aerials are replaced by an internal rotating frame aerial. This apparatus is illustrated. The author's own method, as applied to aircraft, is discussed, with details of results obtained in practice. An extended Discussion followed, in which maritime applications were particularly discussed. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Survey)

307. SLEE, J. A., "Development of the Bellini-Tosi System of Direction-Finding in the British Mercantile Marine," JIEE, vol. 62, no. 330, pp. 543-550 and (discussion) 550-557; June 1924. ABSTRACT: Account of various sources of error encountered during development of system as aid to navigation in British mercantile marine; these errors can be isolated and their causes removed one by one; deals with application of instrument to purposes of navigation; table showing high degree of accuracy which has been attained. (a-3, b-1, c-1, d-5, e-0, Summary)

308. CHIREIX, H., "Directive Short-Wave Transmission," Radio-électricité, (Bull. Technique), vol. 5, pp. 65-73, 25 July 1924. ABSTRACT: This paper (by the head of the Research Department of the Société Francaise Radio-électrique) describes the theory underlying the development of the so-called "beam" wireless transmitters by the above-mentioned company. The paper, which is mainly theoretical and mathematical, deals with the various aerial arrangements which may be used. The author considers first the simple case of an aerial situated at the focus of a parabolic reflector consisting of a series of vertical wires. It is then shown that the aerial at the focus may be dispersed with, provided the various wires forming the reflector are fed with high-frequency currents of the appropriate phase and magnitude. This is the method actually adopted, and the considerations in the remainder of the paper are based on this system. The author then considers the two extreme cases of a parabola, one with the focal distance infinite and the other with it zero. These two cases correspond to a parabola of infinite aperture and zero aperture respectively. In each case the aerials are situated in a straight line, in one case in the direction of the axis and in the other perpendicular to it. The distribution or directivity is then worked out for these two cases. From this the result is obtained for a combination of the two systems, and in detail for the particular example of fifteen aerials arranged in rows and columns, forming a rectangle, with five aerials in its length and three in its width. In this case the system, with a power of 1 kw, gives in the chosen direction an effect equivalent to 180 kw radiated from an ordinary aerial. In conclusion, the author states that experiments are in progress with various of these aerial systems, with powers of the order of 10 to 20 kw, and of waves from 70 to 210 metres (a-3, b-1, c-3, d-3, e-0, f-Theory)

309. MARCONI, G., "Results Obtained over Very Long Distances by Short-Wave Directional Wireless Telegraphy, More Generally Referred to as the Beam System," Roy. Soc. Arts., J. vol. 72, pp. 707-617, Disc., 617-621; 25 July 1924. See also Engineer, vol. 138, pp. 245-247; 29 August 1924: El. Rev. vol. 95, pp. 155-157, 25 July 1924. ABSTRACT: Gives further details of the experimental work carried out by Marconi and Franklin on short wave-lengths, details of which have already been published by Franklin. Further work carried out on the ss. Elettra is given in detail, and the application of short wave-lengths to wireless traffic with directional apparatus is advocated. The Austin formula is stated not to apply to short wave-length propagation, and the usual disadvantages attributed to short wave-length working, such as variability, etc., are repudiated. Short-wave working has been conducted from Poldhu to Australia, Canada, and the U.S.A., both for telegraphy and telephony, with valve apparatus consuming 28 kw, and without any reflecting aerial arrangement. Laws formulated by Franklin for reflector aerial arrangements are detailed. An extended discussion followed. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

310. ANONYMOUS, "Wireless Position Finding: Frame Aerial Ship Equipment," Wireless World, vol. 14, pp. 587-588; August 1924. ABSTRACT: A general description of directional wireless transmission and receiving equipment. (a-6, b-2, c-1, d-5, e-0, f-Description)

311. ROBINSON, J., "Wireless Position-Finding: Frame-Aerial Ship Equipment," Wireless World, vol. 14, pp. 587-588; August 1924. ABSTRACT: An elementary description of a shipboard rotatable loop controlled mechanically from below decks. (a-4, b-2, c-1, d-5, e-821, f-Elementary description)

312. SMITH-ROSE, R. L., "Some Radio Direction-Finding Observations on Ship and Shore Transmitting Stations," JIEE, vol. 62, pp. 701-711; August 1924. ABSTRACT: An account is given of experiments conducted for the Radio Research Board at Slough and Orford, observations being made on ship transmitters at various positions in the North Sea. Damped waves of length 450 m. were employed. The results obtained are analysed in detail and the various errors encountered are described. The general conclusion drawn from the experiments is that when the path of transmission is entirely over the sea and in a direction making an appreciable angle with the coast line, so as to be free from coastal refraction effects, the accuracy of radio direction finding is sufficient for many navigation purposes up to ranges approaching 100 miles. Observations taken on various land stations with spark transmitters on wave-lengths of 450 m. and 600 m. show that for greater distances over sea the variable "night" errors encountered are of a much higher order. When the propagation of the waves is entirely over land the corresponding variations are encountered at shorter distances. The minimum range of transmission for the occurrence of the well-known phenomena of night effects on closed loop direction finders is about three times as great over sea as that over land. The exact ratio is possibly dependent on the relative conductivities of the sea and land, and the resulting attenuation accompanying the propagation of the electromagnetic waves. (a-3, b-1, c-1, d-5, e-0, f-Experimental study)

313. ECKERSLEY, T. L., "The Energy of Atmospherics," Electrician, vol. 93, no. 2412, pp. 150-151 and 155; 8 August 1924. ABSTRACT: Discusses electric disturbances produced in receiving aerials, stray waves, etc., and their mathematical treatment. (a-3, b-2, c-1, d-5, e-0, f-Analysis)

314. CANN, J.O.G., "Modern Aids to Navigation," Can. Ry. Club - Official Proc., vol. 23, no. 6, pp. 22-31 and (discussion) 31-36; September 1924. ABSTRACT: Discusses location of ship's position by radio. (a-3, b-1, c-1, d-7, e-0, f-Survey)

315. MEISSNER, A., "Propagation of Electric Waves round the Earth," Zeits. f. Hochfrequenztechn., vol. 24.4, pp. 85-92; 1924. See also Elek. u. Maschinenbau, vol. 42, pp. 625-630; 26 October 1924. Paper read before the Deut. Naturforscher u. Ärzte, Innsbruck; September 1924. ABSTRACT: A discussion of the results obtained with short waves in transmission over great distances with small power leads to the conclusion that the assumption of the existence of the so-called Heaviside layer is not necessary. The hypothesis advanced is that at short distances from the transmitter the effect of the "surface" wave predominates, while at greater distances the effect of the "space" wave is far the greater, and at very great distances the amplitude is practically constant. Surface waves are regarded as issuing from the half of a dipole above the earth, the other half of the dipole being the "image" in the earth of the upper half. Space waves result from a dipole high above the earth. With very long waves we are concerned only with surface waves, and with extremely short waves only with space radiation. With intermediate wave-lengths both surface and space wave effects may be concerned. The bending round the earth in the case of short waves may possibly be explained by variation in the dielectric properties of the atmosphere, the phenomenon being analogous to the refraction of light rays. (a-3, b-1, c-4, d-4, c-0, f-Theory)

316. CARSON, J.R., "The Building-up of Sine Currents in Long Periodically Loaded Lines," Bell System Techn. J., vol. 3, pp. 558-566; October 1924. ABSTRACT: An analytical investigation of this problem, which has previously been studied experimentally by A. B. Clark (1923) by the aid of an oscillogr ·h, and analytically by K. Küpfmüller (1924). (a-3, b-1, c-1, d-1, e-0, f-Theory)

317. SMITH-ROSE, R. L., "The Effect of the Shape of the Transmitting Aerial upon Observed Bearings on a Radio Direction Finder," JIEE, vol. 62, pp. 957-963; November 1924. See also Science Abstracts, vol. 28, p. 173; 1925. ABSTRACT: Experiments to determine to what extent emission of abnormally polarized waves by aerials of different shapes from ground transmitting station was responsible for frequent occurrence of variable "night" errors at ground direction-finding station. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

318. LYOT, M. B., "Study of a Particular Case of the Effect of an Open Antenna upon the Loop of a Direction Finder," Onde Elec., vol. 3, p. 530; November 1924. ABSTRACT: A description is given of experiments carried out in the summers of 1917 and 1919. Suppose a vertical coil of self-induction L is tuned to resonance for a certain wave-length by a condenser C', and its capacity C with respect to earth is also tuned to the same wave-length by means of an inductance L'. Simple theory then shows that the incidence of a plane wave on the coil gives rise to a current whose amplitude is $K_1H_x \cos \alpha + K_2H_z$, where H_x and H_z are the magnetic and electric components respectively of the wave, K_1 and K_2 are functions of C, C', L, L' and R (the resistance), and α is the angle between the plane of the coil and the direction of the wave. Experiments carried out with two coils, one of which was used as a standard for comparison, gave results in good agreement with theory. The adjustment of L' need not be made exactly if a resistance R' is introduced in series, producing strong

damping. The amplitude formula gives for polar diagram a limaçon, and the shape of this can be altered within fairly wide limits. In the absence of the resistance R' the antenna effect for a single turn coil is much greater than the coil effect, and the antenna effect can be increased by connecting a few metres of wire to the highest point of the coil. It is thus possible, by varying the relative values of the antenna effect and the coil effect, to utilise the two zeros of the limaçon to cut out transmissions from two directions. (a-3, b-1, c-3, d-3, e-0, f-Theory)

319. LARMOR, J., "Why Wireless Electric Rays Can Bend Round the Earth," Phil. Mag., vol. 48, pp. 1025-1036; December 1924. ABSTRACT NO. 1: A mathematical treatment of the subject of the bending of electromagnetic waves around the surface of a sphere. The ionization theory is advanced. ABSTRACT NO. 2: The principle of dynamical similarity shows that for diffraction to offer a solution of the rays crossing the Atlantic, visible light should creep to a sensible degree round a tenth of the circumference of a sphere of 6 cm radius. Now that ray signals are received at the Antipodes, the rays could not travel free unless linked to the earth's surface, or the speed of propagation must increase sufficiently to bend them down. The Heaviside layer solution would mean a frictional term causing absorption, meaning a decay of amplitude in the ratio e^{-1} of a kilometre wave-length after a travel of 10 km., as is shown analytically. A sufficient cause for the requisite velocity increases, without dissipation, for waves travelling horizontally is provided by the free oscillations of ions even sparsely distributed in very high atmospheric regions, for the mean free path will be so long relatively even to long waves, that the travelling ions will in the main swing free under the influence of the waves, and so interact without energy dissipation, scattering being negligible, giving an influence on the velocity without absorption. Also, a receiver collects energy over a range of order λ^2; thus the total energy put into the transmitting layer is reduced at the receiver in the order $\lambda^2/4\pi a^2$, where a is the earth's radius, so that for a kilometre λ the modulus of attenuation is of the order 10^{-4}, which is not excessive. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Theory)

320. SMITH-ROSE, R. L., "Variations of Apparent Bearings of Radio Transmitting Observations on Fixed Stations, Part 1," R. R. B. Spec. Rpt. No. 2, H. M. Stationery Office. See also Engineering, vol. 118, p 866; December 1924. ABSTRACT: An interim report on results obtained from a network of receiving stations relative to variations of apparent bearings of transmitting stations. See Abstract No. 321 for more detail. (a-6, b-2, 3, c-1, d-5, e-0, f-Description)

321. ANONYMOUS, "Direction-Finding Wireless," Engineering, vol. 118, p. 866; December 1924. ABSTRACT: A two-column article on the report by Smith-Rose and Barfield entitled "Variations of Apparent Bearings of Radio Transmitting Stations. Part I. Observations on Fixed Stations." Robinson System Equipment was used at wavelengths of 2 and 9 km on spark transmissions. Errors were measured under various conditions for navigational purposes. Variations during sunrise and sunset are mentioned. See Abstract No. 320. (a-4, b-1, c-1, d-5, e-822, f-Review of Abstract 320)

322. SLEE, J. A., "The Problem of Beacon Stations," Wireless World, vol. 15, no. 11, pp. 330-334; 10 December 1924. ABSTRACT: Deals with stations for marine navigation. Describes purposes of system, and discusses its advantages and limitations. (a-3, b-2, c-1, d-5, e-0, f-Radio beacons)

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323. BETZ, O., "Antenna Height and Detector Reception," Zeit. für Hochfrequenztechnik, vol. 26, no. 5, pp. 128-132; 1925. ABSTRACT: In a previous paper, author states that increasing effective height of receiving aerial increases signal strength received; relations between radiation and loss resistances are investigated in present article for maximum signal strength with crystal reception. (a-3, b-1, c-4, d-4, e-0, f-Radiation and propagation)

324. IMMLER, W., "Equal Azimuths and Their Relation to Direction-Finding," Zeit. f. Hochf., vol. 26, p. 71, pp. 73-88; 1925. ABSTRACT: Complete theory of finding azimuth, derived from nautical practice, and explains its application to finding radio station. (a-3, b-1, c-4, d-4, e-0, f-0)

325. SCHELLER, O., "Antennas of Great Span Width (Antenne grosser Spannweite)," Zeit. für technische Physik, vol. 6, no. 12, pp. 651-652; 1925. ABSTRACT: In antenna installation for high-power station, principal cost is that of masts, so it is distinct gain if these can be separated to great distances apart; describes type of aerial arrangement which allows great spans to be used; aerial conductor, which may be of stranded aluminum wire, is supported by steel wires and arrangement is such that resistance is not much affected by presence of steel supporting wires; necessary tension is supplied by weights at lower end, permanent anchors being used. (a-3, b-1, c-4, d-4, e-0, f-Antennas)

326. TUVE, M. A., "Note of a Radio Method of Estimating the Height of the Conducting Layer," Terr. Mag., vol. 30, p. 15; 1925. ABSTRACT: See Abstract No. 288. (a-4, b-1, c-1, d-1, e-0, f-0)

327. WENDT, E., "Determination of Points by Means of Direction Finding," Ann. d. Hydrogr., vol. 53, p. 96; 1925. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

328. WEDEMEYER, A., "Determination of Position by Radio Observations," Zeit. f. Hochf., vol. 25, p. 150; 1925. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, c-0, f 0)

329. SMITH-ROSE, R. L., "Variations of Apparent Bearings of Radio Transmitting Stations," R. R. B. Spec. Rpt. No. 3, H. M. Stationery Office; 1925. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Experimental)

330. MESNY, R., Usages des Cadres et Radio-goniométrie, Chiron, Paris; 1925 ABSTRACT: Not available. (a-4, b-6, c-3, d-3, e-0, f-0)

331. CLOSE, C., AND WINTERBOTHAM, H. St. J. L. (Editors), Text Book of Topographical Surveying, H. M. Stationery Office; 1925. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

332. SMITH-ROSE, R. L., "Atmospherics," World Power, vol. 3, no. 13, pp. 20-25; January 1925. ABSTRACT: Origin and nature of atmospherics; directional observations on atmospherics; radiation from lightning flash; investigation of wave form. Bibliography. (a-3, b-2, c-1, d-1, e-0, f-Atmospherics)

333. SMITH-ROSE, R. L., AND COLEBROOK, F. M., "Some Experiments with Aerial and Earth Systems for Reception," Experimental Wireless, vol. 2, no. 16, pp. 207-217; January 1925. ABSTRACT: Description of measurements carried out at Nat. Physical Laboratory, Teddington, Eng., with view to determining most efficient aerial and earthing systems for short wave reception, with particular reference to use of an earth-screen for reception. (a-3, b-1, c-1, d-5, e-0, f-Description)

334. AUSTIN, L. W., "A Suggestion for Experiments on Apparent Radio Direction Variations," Proc. IRE, vol 13, p. 3; February 1925. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0).

335. BAEUMLER, M. "Recent Investigations on the Propagation of Electromagnetic Waves," Proc. IRE, vol. 13, pp. 5-27; February 1925. ABSTRACT: Diurnal and annual variations of intensity of the waves are observed, the magnitude of which are different at different times, and for which no unimpeachable explanations have yet been found. A diminution of field intensity is also observed with distance which is not in agreement with the theoretical law connecting these quantities. In addition, it has not yet been possible to determine whether the daytime or the night-time value of the received electrical field is the normal value - that is, which of these values is to be regarded as the one which is in accordance with the theory. In order to clear up these questions quantitative measurements have been carried out since the summer of 1922 on the signal strength of the American high-power stations WQK and WSO. It has been shown that these phenomena can be studied only by continued measurements. Curves are given showing the field strengths on three successive days and nights once each month for the year February, 1923 - January, 1924. In view of the agreement of the calculated values of field strength and the values actually found at night, it is concluded that the night value is to be regarded as the normal one and the day value as the abnormal

or disturbed one. An explanation of the diminution of field intensity is given by assuming that the atmosphere is "electrically turbid" by day in consequence of the heating of the earth and the resulting vertical motion of masses of heated air. The waves are refracted, absorbed, or reflected, and hence weakened, at the boundary surfaces of air masses of different densities. Diurnal and annual variations of field intensity can readily be explained by this theory. It is not found possible to establish any difference between field intensity in a large city and in neighbouring open country. The derivation of a universally applicable formula giving the field strength, while taking account of all absorption losses, is regarded as impossible at present. The empirically determined absorption factor of the Austin-Cohen formula does not give results in agreement with measurement, but yields markedly smaller values of field intensity. On the other hand, the absorption factor found by L. F. Fuller gives values in good agreement with the results of measurements. A bibliography of the subject is appended. (a-3, b-1, c-1, d-1, e-0, f-Experimental with 22 references)

336. DONISTHORPE, H., "The Marconi Marine Radio Direction Finder," Proc. IRE, vol. 13, pp. 29-47; February 1925. ABSTRACT: The Bellini-Tosi system of direction-finding is described. Later developments of the system by the Marconi Co. are then described, these being the use of aperiodic aerials, the adaptation of the system for the finding of Sense, and the application of the system to ships. Methods for correcting for various possible errors are given. A number of instances are given of the great use of marine direction-finders, some showing how ships in distress who do not know their own position accurately can be located, others showing how rendezvous can be made in fog, and how time can be saved in fog. (a-3, b-1, c-1, d-1, e-0, f-Description)

337. DU BOURG, G. DE BOZAS, "Direction Finding in the Study of Fading," Société Francaise des Electriciens - Bul., vol. 5, no. 42, pp. 157-167; February 1925. ABSTRACT: General review of theory of direction finding with single rotatable coil; author points out that such a coil suitably balanced and fitted with Mesny compensator may be used in investigation of fading; good reception with sharply defined zero denotes presence of one wave only - that is, wave normally transmitted; quotes actual results obtained. (a-3, b-1, c-3, d-3, e-0, f-Review)

338. SMITH-ROSE, R. L., AND BARFIELD, R. H., "On the Determination of the Directions of the Forces in Wireless Waves at the Earth's Surface," Proc. Roy. Soc., vol. 107, Ser. A, pp. 587-601; March 1925. ABSTRACT: A method is described for measuring the inclination of wireless waves to the vertical. The apparatus consists of a Hertzian rod, 30 feet long, with a receiver at the centre. The rod is capable of rotation in a vertical plane about a horizontal axis, which axis can itself be rotated in a horizontal plane, thus allowing the aerial to be capable of rotation in any vertical plane. The axis of rotation is chosen to be perpendicular to the direction of propagation, and the rod is rotated till a minimum is obtained. This position is usually for the rod nearly horizontal, and the angle of deviation from the true horizontal is the angle of inclination of the electric force to the vertical. Measurements were made on various transmitting stations, the wave-lengths varying from 450 metres to 6900 metres. Various receiving sites in the south of England were used. In most cases the angle of inclination was less than 3°. In certain cases the wave-length of the transmitter varied, and the angle of inclination was greater the shorter the wave-length. The view is expressed that as the conducting surface of the earth the angle of inclination can never be large, no matter what the direction of the incident waves to the surface may be. The actual inclination depends on the conductivity and the frequency of the waves according to the relation, $\sigma = n/4 \tan^2 \beta_0$ where σ is the conductivity of the earth, n the frequency of the waves, and β_0 the inclination of the electric force to the vertical. Values for the conductivity were obtained by measuring β_0 for a number of different sites in the south of England, these values lying between 0.14×10^8 and 4.7×10^8 (E.S.U.). (a-3, b-1, c-1, d-5, e-0, f-Thorough experimental study and theoretical analysis)

339. WELLS, N., "Marconi Wireless Beam Reflector," Engineering, vol. 119, pp. 309-311; 13 March 1925. ABSTRACT: The revolving wireless-beam reflector erected on Inchkeith Island, in the Firth of Forth, supersedes an earlier wooden model erected in 1920, and is the result of much experimental work during which numerous reflector systems were built. The reflecting system consists of a set of vertical tuned wired lying on a surface whose horizontal section is parabolic, the transmitting aerial being a plain suspended wire of half wave-length dimensions situated at the focus. There are two such reflectors symmetrically placed back to back, the reflecting wires being stretched between latticed frameworks carried at the top and bottom of a lattice tower 32 ft high, and the whole arrangement is carried on a framework (carried on a circular rail track bedded in concrete), which is made to rotate once in two minutes. The distance from the centre to the tip of one of the arms is 31 ft 9 in., and the width across the tips of each pair of arms is 43 ft. The wave-lengths used varied from 4.25 to 6.25 m. Illustrations of the tower and driving gear, and also details of the transmitter for producing high-frequency damped waves, are given. The polar diagram is such that bearings can be obtained to within 1/4 point up to about 10 miles range. The Morse signals are transmitted automatically, and are controlled by the revolution of the reflector, a special code being used to give the various directions. The receiving apparatus, as installed on the ROYAL SCOT, and the method of use, is described, special reference being made to the arrangements for keeping the accuracy with which bearings may be found approximately constant as the ship approaches the transmitter. (a-3, b-1, c-1, d-5, e-0, f-Description)

340. BLONDEL, A., "On the Acoustic Selection of D-F," Comptes Rendus, vol. 180, pp. 1000-04; 30 March 1925. ABSTRACT: The radio beacon at Cape Gris-Nez was in 1923 changed from a spark system to a modulated continuous wave system operating on a wave-length of 1000 m. With about 100 watts in the aerial the radiogoniometer range is over sixty miles. The modulation is at musical frequency, the letter G being transmitted for fifteen seconds, followed by "longs" for thirty seconds, then the letter G for a further fifteen seconds, and finally silence for thirty seconds. It is suggested that if numerous beacon stations of this type are installed the difficulty of isolating them from one another for direction-finding on board a vessel can be overcome by modulating the transmissions at widely different musical frequencies, and arranging for selectivity in one of the stages of the low-frequency amplifier used in the receiving set. Further, there may be automatic separation of the transmissions from the various neighbouring stations by means of regulated clocks. (a-3, b-1, c-3, d-3, e-0, f-Qualitative description)

341. BONTCH-BROOJAVITCH, M. A., "Short Waves and Directive Antennas," Electritchestvo, no. 4, pp. 228-234; April 1925. ABSTRACT: Author applies original radio-optical, graphical method to study of distribution of radiation around system of vertical aerials, this method being simpler and more general than those proposed by Ballantine and Chireix for same purpose. (a-3, b-1, c-2, d-2, e-0, f-Study)

342. MERRITT, E., BIDWELL, C. C., AND REICH, H. J., "Changes Observed in the Direction of Radio Signals at the Time of the Eclipse of January 24, 1925," Franklin Inst. - Jl., vol 199, no. 4, pp. 485-492; April 1925. ABSTRACT: Results of observations on Stations WEAF and WGY. (a-3, b-1, c-1, d-1, e-0, f-Solar Observations)

343. NICHOLS, H. W., AND SCHELLENG, J. C., "Propagation of Electric Waves over the Earth," Bell System Tech. Jour., vol. 4, p. 215; April 1925. ABSTRACT: A comprehensive discussion of the effects produced by the earth's magnetic field. (a-5, b-1, c-1, d-1, e-0, f-Theory)

344. PFEUFFER, H., "Observations on Reception with Frame Aerials," Elektrotechnik u. Maschinenbau, vol 43, no. 22, pp. 64-65; 21 May 1925. ABSTRACT: Shows that plane of maximum reception of frame aerial is not that which passes exactly through transmitting station, but deviates slightly, due (1) to slight deviation experiment by electromagnetic field on account of imperfectly conducting earth, (2) to fact that with cylindrical frame coil spiral winding is actually equivalent to three mutually perpendicular winding planes; investigation to account for fact that with horizontal frame loud signals may be received, while local disturbances are rendered weaker. (a-3, b-2, c-4, d-4, e-0, f-Theory)

345. SMITH-ROSE, R. L., AND BARFIELD, R. H., "Directional Properties of Receiving Aerials," Wireless Engineer, vol. 2, pp. 575-580; June 1925. ABSTRACT: Determines both experimentally and theoretically the directional properties of aerials under widely varying conditions of dimension and wave-length. Owing to the difficulty of analysing the aerial current distribution, the theoretical determination of directivity breaks down. The "radiogoniometer" is employed to experimentally determine the ratio of the currents induced in two aerials of identical dimensions, pointing respectively directly towards and directly away from the transmitting station. Zenneck's theory that the directional effect is greater for short waves than for long, and increases with the ratio length/height of the aerial, is verified for

inverted "L" aerials. Within the present commercial range of wave-lengths, and with normal aerials, the directive effect is of secondary importance, being entirely negligible on long waves received on short aerials, but of just sufficient importance on broadcasting waves (300 - 600 metres) to be taken into account. (a-3, b-1, c-1, d-5, e-0, f-Experimental and theoretical analysis)

346. FORBES, H. C., "Re-radiation from Tuned Antenna Systems," Proc. IRE, vol. 13, p. 363; June 1925. ABSTRACT: D/F errors due to the presence of resonant reradiators are described. Considers Dellinger's theory of radiation for a flat-top antenna (1920) and applies corrections for the induction field strength near to the transmitter. The distortion produced in the field of a distant transmitter by re-radiation from a tuned receiving antenna is then determined by applying these expressions to calculate the secondary field from the latter. The results thus obtained are in good agreement with the observed distortion produced by the Washington Monument upon the field from a distant transmitter, and with that produced by a coil aerial on the antenna of Minnesota University. The "dead-spot" associated with a tuned receiving antenna may be utilised to eliminate interference from a powerful local station. The possibilities of the use of the re-radiated power for short-distance transmission with no local source of power is indicated, and a method is given of determining the approximate equivalent height of an antenna system. (a-3, b-1, c-1, d-1, e-0, f-Experimental investigation)

347. FRANCK, P., "Application of Radio Direction-Finding to Aerial Navagation," Ann. des P.T.T., vol. 14, pp. 529-547; June 1925. ABSTRACT: This paper deals entirely with radiogoniometric measurements made with apparatus installed on aircraft, particularly aeroplanes. The three methods using (1) a single coil movable with respect to the aeroplane, (2) a single fixed coil, and (3) Bellini-Tosi double coils are briefly discussed, and then the methods employed for getting over the difficulties encountered on aeroplanes are described. These include careful screening of all magneto leads by conducting shields earthed every 15 or 20 cm, the use of compensating coils suitably placed with respect to the magneto, screening of amplifiers, batteries, etc., by Faraday cages, symmetrical arrangement of circuits, etc. Errors of measurement are next dealt with and the methods employed for navigation described. Results obtained on several long flights in France show that the movable coil method can be made to give accuracy quite sufficient for practical purposes. The method is sensitive to magneto noises and presents considerable quadrantal errors, but these difficulties can be to a very large extent eliminated. The errors rarely exceeded by more than 5 degrees the mean error, which changed with each trip. This seems to indicate that, for each trip, the errors are the sum of a systematic error and an accidental error less than 5 degrees. (a-3, b-1, c-3, d-3, e-0, f-Measurements)

348. ROOTS, J. D., "Directional Control," Wireless Engineer, vol. 2, p. 667; July 1925. ABSTRACT: An ultra-short wave transmitter is situated at a fixed point and projects a beam along a path which may vary in altitude and azimuth as desired. A vessel is provided with a receiver which is located in a metal compartment having a conical-shaped input horn. The compartment and horn act as a shielding device to the beam, unless the beam's axis is coincident with that of the conical framework. If the axes coincide, the receiver will be affected and the vessel can be steered to the fixed point by keeping the axis of the receiving framework and beam coincident. (a-6, b-8, c-1, d-5, e-0, f-British patent 229, 820)

349. TYERS, P. D., "Some Recent Observations on Periodic Fading and Night Effect," Exper. Wireless, vol. 2, pp. 650-654; July 1925. ABSTRACT: An account is given of observations carried out at Watford on the variations of strength of the transmissions from various British and Continental broadcasting stations. Some of the observations - as, for example, the fact that Birmingham gave strong fading and night distortion while Glasgow and other more distant stations gave little or none - are difficult to reconcile with any theory not taking account of local effects. Periodic variations were noticed in the case of Bournemouth. (a-3, b-1, c-1, d-5, e-0, f-Measurements)

350. DE TUNZELMAN, G. W., "Radio-Propagation," Electrician, vol. 95, no. 2461, pp. 56-57; 17 July 1925. ABSTRACT: Another advance in theory; probable greater complexity than suggested by Larmor shown by mathematical analysis. (a-3, b-1, c-1, d-5, e-0, f-Theory)

351. AUSTIN, L. W., "A New Phenomenon in Sunset Radio Direction Variations," Proc. IRE, vol. 13, pp. 409-412; August 1925. ABSTRACT: It has frequently been noticed that the rotation of the normal axis of a radio compass coil around a horizontal axis at right angles to the true direction of the sending station frequently produces a great sharpness of minimum at a certain vertical angle. It is now found that the angle for the sharpening of the minimum apparently varies regularly with the changes in bearing direction during the before-sunset period. The "sharp minimum" vertical angle starting at 0° to 20° increases with the deviation of the horizontal bearing until, at about an hour before sunset, just before the horizontal-bearing deviation has reached a maximum, it reaches 50° to 80°. As the horizontal bearing returns toward the true direction, the vertical "sharp minimum" angle decreases rapidly, returning to zero and increasing from 50° to 80° on the other side. (a-3, b-1, c-1, d-1, e-0, f-Qualitative experimental study)

352. SMITH-ROSE, R. L., AND BARFIELD, R. H., "Some Measurements on Wireless Wave-Fronts," Exper. Wireless, vol. 2, pp. 737-749; September 1925. ABSTRACT NO. 1: The first part of the article gives the theory and previous work: elementary ideas of radiation of waves from an antenna: determination or wave-fronts with antenna and loop. The second part concerns the determination of the electric and magnetic fields at a short distance from a transmitting station; determination of the direction of the electric field with a Hertzian-rod; determination of the direction of the magnetic field with a tilting coil. The third part gives the effect of the earth's conductivity on the propagation of electromagnetic waves: Zenneck's theory and experimental results. The last part treats the wave-front measurements on waves from distant transmitting station: the Heaviside-layer theory of the propagation of waves. ABSTRACT NO. 2: After giving some elementary ideas of radiation of waves from an aerial the authors describe the apparatus employed and the results obtained in the determination of the direction of the electric field at a short distance from a transmitting station with a Hertzian rod and the direction of the magnetic field with a tilting coil. The former experiment affords a convenient means of measuring the earth's conductivity at wireless frequencies. At medium wave-lengths the angles to be measured are comparatively small, while for waves from 300 to 600 metres the angle of departure of the electric field from the vertical is about 2° or 3°. The values of the earth's conductivity obtained are considered to be more accurate than those hitherto available, the mean value for typical English soils being approximately 2×10^8 electrostatic units, corresponding to a resistivity of 5000 ohms/cm^3. The article concludes with an account of some wave-front measurements, made at Slough, on waves from distant transmitting stations. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Experimental theoretical analysis)

353. SMITH-ROSE, R. L., "The Study of Wireless Wave-fronts," Electrician, 95, pp. 265-266; 4 September 1925. See also Engineer, 140, p 287; 18 September 1929. ABSTRACT: The author discusses the various circumstances giving rise to an apparent deviation in the direction of travel of wireless waves. When the path of transmission is entirely overland the difference in variations by day and night become apparent at thirty miles; when entirely oversea this distance is trebled. The minima problem and methods for the complete determination of the directions of the forces are discussed with the use of these methods in studying the propagation of waves. The results of some measurements made at Slough are given (see preceding Abstract). (a-3, b-1, c-1, d-5, e-0, f-Theory)

354. ANONYMOUS, "Beam Direction-Finding," Electrician, vol. 95, pp. 296-297; September 1925. ABSTRACT: A description of the D/F station at South Foreland, England. The apparatus consists of a transmitter and a unidirectional antenna system mounted on a revolving steel frame work. The antenna structure is rotated continuously at 1 revolution per 2 minutes, and it emits a distinctive signal for each direction at which the antenna is pointed. (a-6, b-1, c-1, d-5, e-0, f-Description)

355. SMITH-ROSE, R. L., "The Effect of Wave Damping in Radio Direction Finding," JIEE, vol. 63, pp. 923-927; September 1925. ABSTRACT: The present paper summarises the hitherto published knowledge on the relative advantages of damped and undamped waves for accurate direction-finding, and then described some special experiments which have been carried out in England on this point. It is concluded that when direction-finding is employed at such times and under conditions which are known to produce the well-known "night effects" of variable errors in bearings and broad signal minima, these effects are equally likely on damped and undamped waves. It thus appears that for marine navigation purposes the type of transmitted wave is immaterial to the accuracy, and that continuous waves,

whether modulated or not, may in future be used with perfect confidence in all cases in which damped waves from spark transmitters have given satisfactory results. (a-3, b-1, c-1, d-5, e-0, f-Theory)

356. ANONYMOUS, "The Wireless Beam," Engineer, vol. 140, no. 3637, pp. 273-274; 11 September 1925. ABSTRACT: Results of tests on Marconi revolving beam, made on yacht Elettra, proved definitely that wireless beam, acting as kind of wireless lighthouse, can help ships safely into port in thick fog or at time when other signals fail. (a-3, b-2, c-1, d-1, e-0, f-Test results)

357. SMITH-ROSE, R. L., "Coastal Errors in Radio Direction-Finding," Nature, vol. 116, pp. 426-427; September 1925. See also Science Abstracts, vol. 28, p. 613; 1925. ABSTRACT: From Zenneck's analysis of the case of a plane-wave travelling over the plane boundary of a semiconducting ground and non-conducting air it can be shown that the velocity of wireless waves in a horizontal direction is greater over land than over sea. Hence the refractive index is less than unity, and a wave will be bent away from the normal in crossing a coast-line from sea to land. Recent measurements by Smith-Rose and Barfield have given a value of about 10^{-8} esu for the effective conductivity of the ground in the south of England at wireless frequencies, which gives a value for μ of 0.999991 for a wave-length of 450 m refracted at the English coast. The ratio of velocities of such a wave over sea and land differs from unity by less than 10^{-5}, which makes it difficult to account for the deviations which have actually been observed, quite apart from the fact that they are in the wrong sense. The deviation $\delta\phi$, however, of a wave crossing the boundary at an angle of incidence θ can be shown to be $\delta\phi = (\mu - 1)\tan\theta/\mu$. Hence, although $\mu - 1$ is only 10^{-5} for the case considered above, $\tan\theta$ tends to become infinite as θ approaches 90°, and in the case of waves which pass along the coast at practically grazing incidence for a distance of several miles, the error may reach a value of 2 or 3 degrees, as actually observed. In many of the cases noted by the author the direction of arrival of the waves was entirely over land, and thus any deviation could scarcely be ascribed to refraction. A. H. Davis has pointed out that in such a case the internally reflected wave may be important. The effect of this is illustrated by photographs of water ripples, which show that the apparent direction may be appreciably altered. With the value of μ deduced above there is still, however, difficulty in explaining the matter on theoretical grounds, for the amplitude of the reflected wave will be very small except for total internal reflection, which will not occur until the angle of incidence is nearly 90°. (a-3, b-1, c-1, d-5, e-0, f-Theory)

358. BREIT, G., AND TUVE, M. A., Letter to Editor on "Note on a Radio Method of Estimating the Height of the Conducting Layer," Nature, vol. 116, p. 357; 5 September 1925. See also Terr. Mag., vol. 30, pp. 15-16; 1925. ABSTRACT: The method used consists in sending out interrupted high frequency wave-trains and observing the wave-form of the received signal. Each wave-train received manifests itself as a temporary rise in the detector current of the receiving set. One particular wave-train at the transmitter gives rise to two received wave-trains at the receiver if a single reflection takes place. One of these trains travels over the ground and the other by way of the layer. Thus the detector current is forced to rise at two different times by the same wave-train from the transmitter and an oscillogram of the detector current shows two humps generally of unequal size. The transmitter was operated with a 500-cycle plate current supply so that a wave-train of 71.3 metres wave-length was emitted during a part of each positive half of the cycle. A succession of single humps is thus emitted. (We have made sure of this by observing the wave form at the same time at the transmitting and the receiving stations.) The receiving station was located 7 miles away from the transmitter in a general direction north, the Potomac River and the City of Washington being between the two stations. We have observed the received wave-form visually and photographically. Double and triple humps were observed on some days, though practically single humps were observed on others. Marked variations in the relative position and amplitude of the humps were observed during 10-minute observation periods. The retardation of the secondary humps with respect to the primary is of the order of 1/1700 second, which corresponds to a retardation over a length of roughly 110 miles and a distance of the layer of the order of 50 miles. Other humps correspond to 100 miles. The origin of triple humps is not clear. The possibilities of a wavy surface in the layer and successive reflections suggest themselves. Experiments on other wave-lengths with different receivers and transmitters and in different locations seem valuable. We are hoping that such experiments will be performed by others as well as ourselves. Some experiments at 600 metres were performed in co-operation with the Radio Corporation of America, the distances between the two stations being about 150 and 100 miles. No definite indication of the presence of the layer was found in these cases. (a-1, b-1, c-1, d-1, e-0, f-Experimental)

359. ROUND, H. J., ECKERSLEY, T. L., TREMELLEN, K., AND LUNNON, F. C., "Measurements of Signal Strength at Great Distances," Inst. El. Eng., vol. 63, pp. 993-1001; Disc. pp. 1001-1011; October 1925. See also Electrician, 94, pp. 538-539; 8 May 1925. ABSTRACT: This paper presents the results obtained by an expedition sent to Australia. Measurements were made of the signal strengths of many stations both on the outward and return journeys and at various places in Australia. The data obtained were most comprehensive and show that Watson's reflection formula is in much better agreement with experience than the Austin-Cohen formula. Watson's formula is put into a practical form. Important theoretical work is presented with regard to the height of the upper layer and day and night transmission. Many observations of atmospherics were made, and the places of origin of these were in many instances located. For further details the original paper should be consulted. (a-3, b-1, c-1, d-5, e-0, f-Measurements)

360. GREEN, E., "The Polar Curves of Reception for Spaced Aerial Systems," Expl. Wireless, vol. 2, pp. 828-837; October 1925. ABSTRACT: The first experiments with polar curves were begun at Broomfield in 1913, but were discontinued on account of the war. The experiments were continued at Letterfrack and Towyn during 1919-20. The completed systems have been in continuous use there since that time until these stations were closed down, and have proved their marked superiority over open aerials or single frame aerials. They provide a receiving system with marked directional properties, resulting in the reduction of atmospheric disturbances, as compared with the signal, and the elimination of possible jamming stations. (a-1, b-1, c-1, d-5, e-0, f-Experiments)

361. SMITH-ROSE, R. L., "High-Frequency Screening," Wireless World and Radio Rev., vol. 17, pp. 694-699; 18 November 1925. ABSTRACT: The theory and action of screens are simply described. Certain practical illustrations are then given showing what type of screen is required for various purposes. For the screening of comparatively large volumes, ordinary wire-netting of about 1-inch mesh is fairly effective and at the same time convenient to apply. Small instruments are best screened by being enclosed in boxes made of tinned iron sheet. Iron is better than copper. All joints must make good metallic contact. (a-3, b-1, c-1, d-5, e-0, f-Theory and experiment)

362. SMITH-ROSE, R. L., "Polarization of Wireless Waves," Wireless World, vol. 17, pp. 859-862; December 1925. ABSTRACT: Gives the theory of the polarisation of electromagnetic waves from a Hertzian oscillator, and from a transmitting aerial. Experiment verifies the theory showing that the radiated waves received from various transmitting stations, operating on wave-lengths from 350 to 12,000 metres, are polarised in a vertical plane during the daytime. Attempts to transmit horizontally polarised waves by a Hertzian oscillator and by a coil aerial show that they can be transmitted over the earth's surface only with difficulty, if at all, and that the effect of such waves is entirely negligible compared with the effect of any vertically polarised waves from the same transmitter. Horizontally polarised waves can, however, be projected upwards and subsequently deflected downwards. (a-3, b-1, c-1, d-5, e-0, f-Theory. See also Abstract No. 368)

363. SMITH-ROSE, R. L., "Aerials and Earth Systems," Wireless World, vol. 17, p. 927; December 1925. ABSTRACT: Considers directional effects in small receiving antennas. (a-4, b-1, c-1, d-5, e-0, f-Theory)

364. FRIIS, H. T., "New Directional Receiving System," Proc. IRE, vol. 13, pp. 685-707; December 1925. ABSTRACT: The paper discusses methods of combining the signal current from different antennae in a directional receiving system and a detailed description is given of a system by which all phase and amplitude adjustments are performed upon the beating inputs of a double detection or superheterodyne receiver. The theoretically derived shape of the directional characteristic of a two-loop system (a coplanar spaced loop) has been verified by experiments, and data on reduction of atmospherics for such a system are given. (a-3, b-1, c-1, d-1, e-481, f-Theory and Experiment)

365. APPLETON, E. V., AND BARNETT, M. A. F., "Wireless Signal Variations," Electrician, vol. 95, pp. 678-679; December 1925. ABSTRACT NO. 1: A short discussion of methods of proving the existence of a Heaviside ionized layer by studying the fading of signals. ABSTRACT NO. 2: In this paper the authors describe a new

method of measuring the angle at which electromagnetic waves reach the ground. A theoretical investigation shows that the signal variations produced by the presence of the stationary wave system due to the down-coming ray will be different in a loop receiver and a small antenna receiver. By working at comparatively short distances and making certain observations the angle of the down-coming ray may be determined. Experiments carried out at Cambridge on signals from 2LO (London) indicated that the down-coming ray made an angle of about 70° with the ground. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Theory)

366. APPLETON, E. V., AND BARNETT, M. A. F., "On Some Direct Evidence for Downward Atmospheric Reflection of Electric Rays," Proc. Roy. Soc., vol. 109, pp. 621-641; December 1925. ABSTRACT: Continuous records of signal strength are made for various broadcasting stations. It is found that the mean signal strength is remarkably constant and the impressed oscillatory variation is strongly suggestive of interference between two rays of which one is of changing phase and amplitude. Evidence as to the height of the supposed reflecting layer is obtained by continuously and uniformly changing the wave-length of the transmitter, the receiver being sufficiently broadly tuned not to be affected by the slight mistuning. If the interference is on the lines of the formation of Lloyd's mirror fringes, such a continuous change in wave-length will cause a succession of maxima and minima, and from the number corresponding to a known change in wave-length the difference in the two paths can be calculated. Approximate determinations, to be amplified later, indicate the height of the reflecting layer to be about 80-90 km. Experiments are also made with loop and T aerials. The loop is in the plane of propagation and the horizontal of the T at right angles to the direction of propagation. The amplifiers on each aerial are adjusted to give equal signal output in the daytime in the absence of fading. Then, when fading occurs, it should be more pronounced on the T if the deviation is lateral in a horizontal plane, and on the loop if it is due to a ray inclined to the horizontal. It is found that the fading on the loop is more pronounced, and the most usual ratio of the loop in the T variation is 2.85. This corresponds to an angle of descent of 69°. Another series of experiments gave 63°. These observations are for 2LO (London), received at Cambridge. Birmingham to Cambridge gave an angle of 48°. With the loop inclined to its normal position, the signal variations are sometimes intensified. This proves that the reflected ray is elliptically polarised, and offers an explanation of the directional errors often experienced at quite short ranges. It is possible to calculate that the reflection coefficient for the ionised layer is between 0.2 and 6%, according to the attenuation factor assumed for the direct ray. The inferior limit to the number of free electrons in the reflecting layer is 10^5 per cc. (a-3, b-1, c-1, d-5, e-0, f-Experimental and theoretical analysis)

367. REYNER, J. H., "The Direction-Finding Equipment at Niton and Cullercoats," JIEE, vol. 63, pp. 1138-40; November 1925. ABSTRACT: These two stations are the first to be equipped by the G.P.O for a regular D/F service. The apparatus is of the well-known Bellini-Tosi type. A tuned search coil is tightly coupled to the aperiodic aerial system; the receiver consisting of a seven-valve, high-frequency amplifier with a detector and two stages of note magnification. After installation the apparatus is calibrated in cooperation with a ship. This is absolutely necessary owing to the errors due to objects in the vicinity of the station. The deviations being due to fixed objects in the vicinity would be expected to remain constant, and experience shows that such is the case. (a-3, b-1, c-1, d-5, e-0, f-Qualitative description)

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368. WILLIAMS, W. E., AND SMITH-ROSE, R. L., "Elimination of Night Errors," Wireless World, vol. 18, p. 430; 1926. Also listed under the title, "Polarization of Wireless Waves." ABSTRACT: Correction on Abstract No. 362. (a-4, b-1, c-1, d-5, e-0, f-Correction)

369. BAUMLER, M., AND ZENNECK, J., "Experiments on the Propagation of Electromagnetic Waves," Zeit. f. Hochf., vol. 27, pp. 117-119; 1926. ABSTRACT: An account of measurements made in August 1924 on the propagation of electromagnetic waves, the principal object being to study their passage from sea to land. The area covered is the triangle formed by Heligoland (at which the transmitter is situated), Cuxhaven and Bremerhaven, between which several receiving stations are erected. The area is particularly favourable, since, assuming straight line propagation, the waves strike the coast at all possible angles, and, further, the large differences in water level at high and low tide allow the same area to be investigated under two different conditions. No perceptible difference is noticed in transmission over sand and muddy shallows, or over the level and sandy mainland, or whether the sand and muddy shallows lie 1 or 2 metres above or below the sea-level. Signals are found to be deviated always in the same sense, and the authors conclude that a distortion of the wave-front occurs when the wave strikes the coast. In view of the comparatively short distance between transmitter and receiver (56 km) remarkable effects of thunderstorms on the signal strength and direction are recorded. (a-3, b-1, c-4, d-4, e-0, f-Experimental results)

370. ESAU, A., "Directional Characteristics of Combined Antennas," Zeit. f. Hochf., vol. 27, pp. 142-150, 1926, vol. 28, pp. 1, 147. ABSTRACT: A mathematical treatment is given (a) for the combination of two non-directive antennae at a certain distance apart and with or without any phase difference, and (b) for the combination of two directive antennae. In both cases it is shown that the sharpness of the directional characteristic is greater for the parallel arrangement (in which the direction of arrival of the waves is normal to the line joining the feet of the antennae) than for the series arrangement. In other respects, however, there are important differences. With the combination of two directive antennae the sharpness of the characteristic is greater than for the single antenna. (a-3, b-1, c-4, d-4, e-0, f-Theory)

371. SMITH-ROSE, R. L., "Variations of Apparent Bearings of Radio Transmitting Stations," R.R.B. Spec. Rpt. No. 4, H.M. Stationery Office, London, England; 1926. ABSTRACT: Not available (a-4, b-3, c-1, d-5, e-0, f-Measurements)

372. FISCHER, F. A., "Errors in Wireless Bearings Caused by the Ship, and Their Elimination," Zeit. f. Hochf., vol. 7, p. 490; 1926. ABSTRACT: A theory is given of the systematic errors introduced into bearings due to the presence of the ship, and methods of compensation are described. The analogy with the deviation theory of the magnetic compass is pointed out. The influence of listing and the ships inclination lengthwise is also examined. (a-6, b-1, c-4, d-4, e-0, f-Theory)

373. MAURER, H. AND FISCHER, F. A., "The Dependence of the Deviation of a Ship on the Wavelength," Ann. d. Hydrogr., vol. 54, p. 401; 1926. See also Science Abstracts, vol. 29, 30, pp. 206, 188; 1926; 1927. ABSTRACT: The analogy between the deviation of a ship's radiation and the compass deviation is drawn. The theory of the quadrantal distortion is given as well as experimental evidence verifying the theoretical considerations. Authors discuss methods of correcting this deviation; experimental observation confirm the theory. The authors show that frequency independence of the deviation is obtained when the natural wavelength and damping of the loop are the same as those of the ship. (a-6, b-1, c-4, d-4, e-0, f-Theory and experiment)

374. HERZOG, A. "The Theory and Operation of the Goniometer," Zeit. f. Hochf., vol. 27, pp. 172-175; 1926. See also Science Abstracts, vol. 29, p. 536; 1926. ABSTRACT: The theory of the goniometer is given, with particular reference to the Bellini-Tosi system, from the point of view of its application to the elimination of disturbances by directional reception. It is shown that the two loops must be quite symmetrical, so that currents of the same phase flow in the stationary coil-pairs. The external phenomena, such as the simultaneous incidence of several rays, which disturb this symmetry, are dealt with. (a-6, b-1, c-4, d-4, e-0, f-Theory)

375. LIEB, A., AND NITZSCHE, D., Funkpeilungen, Richtungs und Standortbestimmung auf funktechnischen Wege, Mittler & Sohn, Berlin, 1926. ABSTRACT: Not available. (a-4, b-6, c-4, d-4, e-0, f-0)

376. MURPHY, W., AND WOLFE, L., "Stationary and Rotating Equi-Signal Beacon," Journal of the Society of Automotive Engineers, vol. 19, p. 209, 1926. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

377. ANONYMOUS, Editorial on "Nomenclature Used in Wireless Telegraphy," Expl. Wireless, vol. 3, p. 201; 1926. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Editorial)

378. SMITH-ROSE, R. L. AND BARFIELD, R. H. "Screening in Receiving Aerials," Wireless World, vol. 18, pp. 61-65; January 1926. ABSTRACT: This article covers the problem of shielding antennas, lead-ins, etc. The whole work is based on the premise that cancellation of the field is brought about by the action of the

shield in setting up secondary fields which are equal and opposite to the primary fields, both in phase and in magnitude. (a-6, b-2, c-1, d-5, e-0, f-Theory)

379. BIDWELL, C.C., "Directional and Intensity Changes in Radio Waves," Journ. Franklin Inst., vol. 201, pp. 107-112; January 1926. ABSTRACT: This is a record of the change in the character of reception which occurs during the transition from daylight to dark. The chronograph records of a galvanometer in the receiving circuit show long-time fluctuations upon which short erratic fluctuations are superposed, there being a definite correspondence between the long-period directional and the long-period intensity changes. This is attributed to the slow drifting of clouds of ionized air across the wave-path, or changes in the height and contour of the Heaviside reflecting layer. (a-3, b-1, c-1, d-1, e-0, f-Measurements)

380. SIMEON, G., "Some Methods for Determining a Point by Means of Radiogoniometry," Rivista Marittima, vol. 59, no. 1, pp. 77-107, 5 figs; January 1926. ABSTRACT: Discusses radiogoniometry between coastal stations and ships for determination of direction, errors in determination aboard ship; five methods of calculation. (a-3, b-1, c-9, d-9, e-0, f-Shipboard errors)

381. TYERS, P. D., "Visual Indicator for D/F," Electrician, vol. 96, p. 31; 8 January 1926. ABSTRACT: This paper suggests that the null point in a single loop D/F system may be indicated by a milliammeter connected in the anode circuit of a rectifying valve whose grid and filament are connected to the output of the audio-frequency amplifier. (a-3, b-1, c-1, d-5, e-0, f-Description of apparatus)

382. ANONYMOUS, "Experimental Results, Radio Direction Finding," Aviation, vol. 20, no. 4, pp. 109-110, 25 January 1926. ABSTRACT: Results of experimental work reported by E. Sibley, Superintendent of Radio, Air Mail Service. (a-3, b-2, c-1, d-1, e-0, f-Experiment)

383. ANONYMOUS, "Use of Radio Compass Fast Extending," Motorship, (N. Y.), vol. 11, no. 2, pp. 109-111; February 1926. ABSTRACT: Its aid to safety of navigation now becoming recognized; describes Kolster-type radio compass frame and bearing finder, and R. C. A. type bearing finder. (a-3, b-2, c-1, d-1, e-0, f-Shipboard compass use)

384. FROMY, E., "Reaction Control for Frame Aerials," Onde Electrique, vol. 5, no. 50, pp. 89-94; February 1926. ABSTRACT: Describes new form of reaction control which is said to be reasonably independent of wave length and simple to handle. See brief translated abstract in Sci. Abstracts (Section B) vol. 29, no. 341, p. 253, 25 May 1926. (a-3, b-1, c-3, d-3, e-0, f-Description)

385. TAYLOR, A. H., AND HULBURT, E. O., "The Propagation of Radio Waves over the Earth," Phys. Rev., vol. 27, pp. 189-215; February 1926. ABSTRACT NO. 1: A theoretical treatment of the general subject of propagation of electromagnetic waves, together with a short introductory history of what had been done earlier by other workers in the field. ABSTRACT NO. 2: A quantitative theory is developed assuming the upper atmosphere to contain free electrons and taking into account the effect of the earth's magnetic field on their motion. The formulae for the refractive indices of radio waves in the electron layer are shown to involve a critical wavelength of 214 metres. This is significant, as the range of radio waves is a minimum at about 200 metres. The electron layer is first considered to be sharply separated from the lower atmosphere, and the waves then suffer total reflection when incident at more than the critical angle determined by Snell's law. The resulting "skip distance" is calculated as a function of wave-length, and good agreement is shown with the results of A. H. Taylor at 16, 21, 32 and 40 metres. The sharp separation is then replaced by a continuous variation in the electron density. Various laws relating density to height are assumed, and by a suitable choice of the parameters involved the observed skip distances are again obtained. The general conclusion is reached that, during full daylight, the average density of free electrons increases with the height and attains a maximum between 70 and 150 miles up. Certain well-known distortion effects, slow- and high-speed fading, are elucidated in terms of the theory assuming a motion of the electron clouds and the consequent shifting of the interference patterns. The effect on long-distance transmission of repeated reflections at the electron layer and the earth is considered. (a-3, b-1, c-1, d-1, e-0, f-Theory)

386. ADCOCK, F., "Some Early Observations on Aircraft with the Four-Aerial Direction Finder," JIEE, vol. 64, pp. 837-838; March 1926. ABSTRACT: The inventor of the Adcock antenna system describes one of his early experiments. The experiment confirmed the theory that deviation errors in the ordinary direction finders were due to the presence of a horizontal component in the electric force. (a-6, b-1, c-1, d-5, e-0, f-Experimental.

387. HOLLINGSWORTH, J., "The Propagation of Radio Waves," Inst. El. Eng., J. 64, pp. 579-589, Disc., 589-595; May 1926. See also Electrician, vol. 96, p. 291; March 1926 and Experimental Wireless, 3, pp. 178-181, Disc., 181; March 1926. ABSTRACT: This paper gives the results obtained from a systematic study of the received intensities of various long-wave transmitting stations at four receiving stations over a period of nearly two years. The apparatus used was substantially the same as in previous work, the only change being the substitution of a Dye transformer for the calibrated mutual inductance. A string galvanometer was also added so that readings could be taken on the ordinary routine of a station. The distances of the receiving stations from the transmitting stations were comparatively short. Simultaneous observations were made whenever possible, and only daylight transmissions were considered. The results obtained are discussed and illustrated graphically. The results show very marked periodic variations and are inconsistent with any law of steady decay. Observations of the transmissions from St. Assise made at the various receiving stations and during several tours, in the latter case using portable apparatus, enabled a curve to be plotted showing the variation of intensity with distance. The curve first rises to a maximum, then reaches a minimum value and finally rises again. The observed effects can most easily be explained on the assumption of an upper reflecting layer giving rise to interference effects between the directly transmitted and the reflected waves. Further observations on sunset effects tend to support this hypothesis. (a-3, b-1, c-1, d-1, e-0, f-Experimental)

388. SMITH-ROSE, R. L. AND BARFIELD, R. H., "An Investigation of Wireless Waves Arriving from the Upper Atmosphere," Proc. Roy. Soc., Series A110, p. 614; 1 March 1926. ABSTRACT NO. 1: The paper discusses the early development and experimental investigation of downcoming waves from the earth's atmosphere. The authors enumerate the methods of measuring the directions of the electric and magnetic fields to give positive evidence of downcoming wireless waves at night. Calculations and examples are given for the determination of the intensity and angle of incidence of downcoming waves. The angle of incidence was obtained in three independent ways: (1) By Hertzian-rod apparatus (provided ground constants are known); (2) By tilting-coil apparatus (provided ground constants are known); and (3) By loop-antenna method (independent of ground constants). ABSTRACT NO. 2: Continuing previous work, the authors have developed modified apparatus for use on shorter wave-lengths. Operating on wave-lengths in the neighbourhood of 400 m., it has been found that the directions of the component forces in the arriving waves can vary considerably from their normal daytime values. Such variations begin at times in the proximity of sunset or after total darkness prevails and accompany the more commonly known variations in signal strength and apparent bearings as observed on a direction-finder. The magnitudes of the variations already observed on the two independent sets of apparatus provide direct evidence of the reception of wireless waves arriving at the earth's surface at a comparatively small angle of incidence (i.e. 30° or less to the vertical). It also appears from the observations that the downcoming waves can be polarised with the electric force in either a vertical or horizontal plane. By combining the above measurements with simultaneous observations of the strength of the vertical electric force of the arriving waves, a means is provided of determining the angle of incidence of both the vertically and horizontally polarised components of the downcoming waves. Typical results of this kind, carried out at Slough on the transmissions from Bournemouth, are given. These show that the angles of incidence can have any value between the limits of 16° and 34°. If the latter value represents the case of a simple wave which has been symmetrically reflected or deflected from the upper atmosphere, the maximum height of the path is found to be 55 miles or 88 km. This is in good agreement with recent estimates for wavelengths of the order employed. The results obtained also furnish data by which the relative intensities of the downcoming and direct waves may be determined. Some measurements have given values varying from 0.3 to 1.4 for this ratio, showing that under the conditions of these experiments the intensity of the downcoming wave can be of the same order as that of the direct wave. By substituting the known value of the earth's conductivity in the theoretical formula given by Sommerfeld, a value of the attenuation of the waves travelling from Bournemouth to Slough can be obtained. On such a basis, the "reflection coefficient" of the upper layer is found to be about 0.2. The search is being continued. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Experimental study)

389. TAYLOR, J. E., "The Propagation of Electric Waves," Roy. Soc. Arts, vol. 74, pp. 392-407; Disc. 408-417; 19 March 1926. See also Engineer, vol. 141, pp. 249-251; 26 February 1926. ABSTRACT: In this paper the author puts forward a plea for the guided wave theory of the propagation of radio waves. In the Discussion, SMITH-ROSE, HOLLINGWORTH and APPLETON quoted experimental results which were considered to contradict the author's theory. (a-3, b-1, c-1, d-5, e-0, f-Theory)

390. ABADIE, P., "Cause and Elimination of Night Errors in Radio Direction-Finding," Rev. Scientifique, vol. 65, p. 210; April 1926. ABSTRACT: Not available. (a-4, b-1, c-3, d-0, e-0, f-0)

391. FOSTER, R. M., "Directive Diagrams of Antenna Arrays," Bell System Tech. J., vol. 5, p. 292; April 1962. ABSTRACT: In this paper are presented two systematic and comprehensive collections of directive amplitude diagrams for arrays consisting of 2 and of 16 antennae respectively, spaced at equal distances along a straight line or axis, with currents of equal amplitude in all the antennae, and with equal phase differences between the currents in adjacent antennae. These diagrams are polar diagrams showing the relative amplitude of the field of the radiation at a great distance, assuming that each antenna radiates equally in all directions in the plane of the diagram. 90 diagrams are given for the 2-antenna array, the spacing varying in steps of 1/8 wave-length up to 2λ and the phase difference varying in steps of 1/8 period from 0 to 1/2 period. An additional set is given for a spacing of 4λ. 612 diagrams are given for the 16-antenna array, the spacing varying in steps of 1/32λ from 0 to 1 wave-length and the phase difference varying from 0 to 1/2 period in steps of 1/32 period. Additional diagrams are given for spacings of 1-1/2, 2 and 4λ. Diagrams and space characteristics are also given for an array of 4 antennae located at the corners of a square of side 1/2λ and no phase difference, and for an array of 32 antennae located along the diagonals of a square, with a separation of 1/2λ between adjacent antennae in each diagonal and zero phase difference. (a-3, b-1, c-1, d-1, e-0, f-Theory)

392. PICKARD, G. W., "The Polarization of Radio Waves," Proc. IRE, vol. 14, p. 205-212; April 1926. Disc., 391-393; June 1926. ABSTRACT: Measurements made on the transmissions from nearly 400 stations, most of which operated on the two frequency bands 3.5 to 4.0 and 7 to 8 megacycles, showed that the electric force at any considerable distance from the transmitter was no longer vertical but predominantly horizontal. Prior measurements of wave polarisation made at the lower transmission frequencies by various workers have uniformly shown the electric force to be principally vertical at all distances from the transmitter. The measurements described here were carried out at Seabrook, New Hampshire, with apparatus essentially similar to those employed by previous workers. Comparative measurements were also made of radiation alternately horizontally and vertically polarised at the source. The results obtained indicated that the ratio of the horizontal to the vertical electric field depended only upon the frequency, distance and the time of day, being substantially independent of the direction of transmission and whether the wave leaving the transmitter was horizontally or vertically polarised. (a-3, b-1, c-1, d-1, e-0, f-Experiments and Theory)

393. ALEXANDERSON, E. F. W., Discussion of "The Polarization of Radio Waves," Proc. IRE, vol. 14, p. 391; 1926. ABSTRACT: A Discussion of Pickard (1926), "Polarization of Radio Waves," See Abstract No. 392. (a-4, b-1, c-1, d-1, e-0, f-Theory)

394. MURPHY, W. H., "Space Characteristics of Antennae," Frank. Inst., J. 201, pp. 411-429; April 1926. ABSTRACT: The author investigates the actual radiated fields in space at unit distance by resolving the true fields into three imaginary components: a vertical component, a horizontal component in the directional plane of wave propagation, and a horizontal component perpendicular to this plane of propagation. This is done for special cases, such as for vertical and horizontal loops and antennae, and from these cases, general formulae for inclined loops and antennae are evolved. The polarisation of the field at any point in space is discussed, and formulae are derived for certain specific antennae. The assumptions made are: (1) The antenna length is small compared with the wavelength; (2) the distance from transmitter to receiver is large compared with the wave-length but small with respect to the earth; (3) the earth is a perfect conductor, and (4) the effect of reflected and refracted waves is negligible. (a-3, b-1, c-1, d-1, e-0, f-Study)

395. STETTER, G., "Propagation of Electric Waves over the Earth," Elek. u. Maschinenbau, Radiotechnik, vol. 44, pp. 33-39; 4 April 1926. ABSTRACT: The author first describes the Bellini-Tosi system of direction-finding and records his experience of direction-finding work carried out in 1916-1918. The effects of trees, of the occurrence of metals and ores, and of the distribution and extent of ground waters are each considered in some detail in their distortional effect on electric wave propagation. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

396. WATSON-WATT, R. A., AND HERD, J. F., "An Instantaneous Direct-reading Radio Goniometer," JIEE, vol. 64, pp. 611-617; May 1926. See also Exper. Wireless, vol. 3, pp. 239-241; April 1926; Wireless World, vol. 18, pp. 367-369; March 1926; Elect. Review London, vol. 98, pp. 515-516; March 1926. ABSTRACT: The original paper on the crossed-loop, cathode-ray tube D/F, now commonly called the Watson-Watt D/F. The authors' original work was carried out in the neighborhood of 10 kc. Paper read before Wireless Section IEE March 1926. The article describes a simple system of two fixed loops, one N-S and the other E-W; with their tuning condensers joined to the plates of the oscillograph. The application to directional recording of atmospherics is also discussed. The article points out applications to navigation. The two large loops were arranged at right angles crossing at their centers. The loops were tuned with their midpoints grounded to eliminate vertical effect. The loops were very large (1200 ft long by 100 ft high) and had five turns for a total area of 20 acres. The plates of the oscillograph were connected directly to the tuning condensers of the loops. A push-pull amplifier circuit is shown for use with loops of smaller area and for weak signals. (a-5, b-1, c-1, d-5, e-0, f-First CRT D/F)

397. HULBURT, E. O., "Kennelly-Heaviside Layer and Radio-Wave Propagation," Frank. Inst., Journ., vol. 201, pp. 597-634; May 1926. ABSTRACT: The first part of this paper is a reprint of an earlier one in conjunction with A. H. Taylor. Further consequences of the theory there outlined are now considered. The field of a radio-wave receiving antenna placed some distance above the earth is to be regarded as due to three rays, one direct, one refracted downward from the Kennelly-Heaviside layer and an upward ray, this last being the reflection from the earth of some descending ray. The rectangular components of the resultant electric force are expressed in terms of the components of these rays, and it is seen that in general the electric vector traces out an ellipsoid randomly oriented with respect to the axes. The linear Herz oscillator as used by Picard enables the component of the electric force in any direction to be measured. The experimental results of Picard for the variation with distance from the transmitter of the ratio of the vertical to the horizontal component at right angles to the true transmission direction are plotted, and compared with the ratios calculated on the assumption that the earth's surface is (a) a perfect conductor, and (b) a perfectly transparent dielectric. When allowance is made for all three rays the calculated curves for a perfectly conducting earth agree tolerably well with the observations, at least for distances less than 500 miles. The wave-lengths considered are 40 and 80 metres. The paper concludes with some discussion of the errors in radio-direction bearings arising from downward reflection by the Kennelly-Heaviside layer. These errors are significant when the downward rays descend at angles greater than about 20° to the horizontal. Thus close to and very far from the transmitter these errors will be slight for all wave-lengths, a result in general accord with observation. (a-3, b-1, c-1, d-1, e-0, f-Theory)

398. WATSON-WATT, R. A., "The Directional Recording of Atmospherics," JIEE, vol. 64, pp. 596-610; May 1926. See also Experimental Wireless, vol. 3, pp. 234-238; April 1926. ABSTRACT: A detailed description is given of an apparatus for the continuous recording of the apparent direction of arrival of atmospherics, and typical examples are given of the data obtainable from such recorders. These examples show the diurnal variation of intensity of atmospheric disturbances, the diurnal variation of apparent direction of arrival, and the location of apparent sources of atmospherics by a group of recorders. In essential features the recorder consists of a frame-coil rotated about a vertical axis by means of clockwork at a speed of four (or if desired, eight) revolutions per hour. The amplifier has resistance-capacity coupling in the high-frequency stages, which are followed by a detector and two stages of low-frequency amplification, transformer coupling being employed for the latter. In the anode circuit of the last valve is introduced as Abraham and Bloch moving-iron oscillograph, which is used for recording the atmospherics by means of a pen on a drum revolving with the coil, the pen tracing a helix of 3 mm. pitch. The limitations of the instrument are pointed out, but these are more than counterbalanced by the continuous records obtained and by the ease of maintenance and reliability of operation. (a-3, b-1, c-1, d-5, e-0, f-Experimental)

399. BLONDEL, A., "New French Radio Beacons," La Science et la Vie; 1926. See also Annales des Postes, vol. 15, pp. 478-491;

June 1926. ABSTRACT: There is in course of development in France a comprehensive system of radio beacon stations for the use of ships carrying some form of direction-finding apparatus. These beacons are divided into three classes: (1) Long-range beacons with a range of the order of 200 miles; (2) storm beacons with a range of 50 miles; and (3) port beacons with a range of 20 miles. The functions of these various beacons are obvious from the titles. They are all automatic in operation, sending out their characteristic signals at prearranged times. There will be finally five of the first type, twenty-five of the second, and nine of the third. The type of transmitter finally approved employs valves and emits modulated continuous waves. (a-3, b-1, c-3, d-3, e-0, f-Description of equipment)

400. CHAPMAN, S., "Ionization of the Upper Atmosphere," Roy. Meteorolog. Soc., Journ., vol. 52, pp. 225-236; July 1926. ABSTRACT: It has been established that short wireless waves, 500 metres or less, can be reflected downwards at night at remarkably small angles of incidence. Observations of reflection at night, for wavelengths about 200 metres, indicate that the effective ions are free electrons. Positive molecular ions must also be present, but will take only a negligible share in the bending of the waves. It is shown that the wireless evidence indicates that the upper atmosphere is ionised in a layer of unknown thickness which extends down to 40 or 50 km above the ground by day, and to about 90 km. by night, the rise of the under surface being due to the progressive recombination of the ions at the lower levels after sunset. The electron density at about 90 km at night is at least 100,000 per cc. The greater thickness of the layer by day is obviously due to solar action. The degree of accordance between the wireless and magnetic data for the conducting layer may be considered satisfactory in the present state of knowledge. It is not known definitely what constituent of the air is the one ionised or what is the ionising agent. The sun's ultra-violet radiation is absorbed mainly by ozone, and if, as the discussion here given shows to be quantitatively possible, the ultra-violet radiation is the cause of ionisation, the latter must be effected by the ozone absorption, and ozone must be the ionised constituent. Against this is to be set the apparent unlikelihood of a large increase in the ultra-violet radiation at sunspot maximum, such as seems required by the magnetic data. But the only alternative source of ionisation is corpuscular radiation from the sun, which falls on the sunlit hemisphere without deflection by the earth's magnetic field. Such corpuscular radiation must therefore be electrically neutral, whether ionised or not. It is shown that the spectrum of the aurora constitutes valuable information regarding the composition of the upper atmosphere, though it can only partly be interpreted at present. The auroral spectral green line is discussed. (a-3, b-1, c-1, d-5, e-0, f-Experiment and theory)

401. ALEXANDERSON, E. F. W., "Polarization of Radio Waves," Trans. AIEE, vol. 45, pp. 636-640; July 1926. ABSTRACT: The author outlines the theory of wave motion and describes a mechanical model for studying wave polarisation. The phenomena of fading can be reproduced mechanically through polarisation in a single wave path. Experiments with the model, as well as actual measurements with exploring antennae, indicate the presence of a horizontal and a vertical wave component with different velocities of propagation, the two waves giving plane polarisation when in phase and circular polarisation when 90° out of phase. Irregularities of direction-finder indications on long waves can thus be explained by the presence of horizontally-polarised wave components. (a-3, b-1, c-1, d-1, e-0, f-Theory)

402. BAINBRIDGE-BELL, L., "Marine Direction Finding," Electrician, vol. 97, no. 2513; pp. 125-126; 30 July 1926. ABSTRACT: Latest developments; details of Radio Communication Co.'s apparatus: eliminating "vertical effect". (a-3, b-2, c-1, d-5, e-0, f-Summary)

403. TURNER, L. B., "Wireless Position-Finding on Ships," Electrician, vol. 97, no. 2513, pp. 125-126; 30 July 1926. ABSTRACT: Results of recent research; theoretical considerations; relative accuracy in day and at night. (a-3, b-2, c-1, d-5, e-0, f-Research report)

404. ANONYMOUS, "The Ultra Powerful Projector and Hertzian Apparatus at Calais," Bul. Technique du Bur. Veritas, vol. 8, no. 8, pp. 149-151; August 1926. ABSTRACT: New Langevin piezo-electric projector which enables vessels provided with receiver to know their exact position and distance from Calais jetty within radius of 4000 m and independent of weather conditions. (a-3, b-1, c-3, d-3, e-0, f-Description)

405. DUNMORE, F. W., "A Unicontrol High-Frequency Radio Direction-Finder," Bureau of Standards, Science Papers, No. 525, pp. 25-35; 1926. See also Exper. Wireless, vol. 3, p. 641; October 1926. ABSTRACT: The Bureau of Standards was asked to develop for the United States Coast Guard a simple type of radio direction-finder which should function on 2100 kc (143 metres). Such a device enables a ship equipped with it to locate another ship readily. This paper describes the development of such a direction-finder and its installation on a Coast Guard patrolboat. The direction-finder coil consists of four turns of ignition cable wound on a 20-in. frame. It is installed over the pilot-house and rotated from below. A tuning unit and coupling transformer have been designed so that the direction-finder coil may be used on the ship's receiving set without changing its tuning adjustments, which are locked in the 2100-kc position. A special form of automatic balancing condenser operated by a special cam rotating with the direction-finder shaft is incorporated in this instrument whereby a clear minimum may be obtained at all angular positions of the coil without manual operation of the balancing condenser. The controls necessary when taking a bearing are thus reduced to one—that of rotating the direction-finder coil to obtain the minimum signal. (a-1, b-1, c-1, d-1, e-0, f-Description)

406. STEEL, W. A., "A Direct-Reading Radio Compass," Canadian Electrical News, vol. 35, pp. 37-39; August 1926. See also Science Abstracts, vol. 29, p. 536; 1926. ABSTRACT: Two loop antennas arranged at right angles are each connected through suitable r.f. amplifiers to a pair of plates of a cathode-ray oscillograph. Since the pairs of plates of the oscillograph are also at right angles, the line traced out by the path of the spot on the screen will give a visual indication of the direction of the incoming signal. The deflection due to each pair of plates is proportional to the signal from the corresponding loop. (a-6, b-2, c-1, d-7, e-0, f-Description)

407. SMITH-ROSE, R. L., AND BARFIELD, R. H. "The Cause and Elimination of Night Errosion Radio Direction-finding," JIEE, vol. 64, pp. 831-838; Disc., pp. 838-843; August 1926. See also Experimental Wireless, vol. 3, pp. 367-369; June 1926. ABSTRACT NO. 1: The paper describes some early work done with crossed-U antennas and Adcock antennas in measuring and eliminating night effect. The authors conclusions are that lateral deviation of the radio waves plays a negligible part in producing large and variable night error, and that these errors are entirely due to the arrival of downcoming waves polarized with the electric vector horizontal. ABSTRACT NO. 2: Reference is made to the authors' previous work on direction-finding. It now appears that the variations observed are caused by the action of the horizontal components of the electric force in the downcoming waves on the horizontal parts of the D/F loops. Another part of the work has been to ascertain whether the downcoming waves have been laterally deviated from the great-circle plane through transmitter and receiver. The experimental arrangements described in the paper are a modification of a system patented by F. Adcock, in which the aerials are mounted and connected so as to ensure that only the vertical parts are acted upon by the arriving waves. The vertical aerials are comprised of complete Hertzian oscillators with leads taken horizontally from their mid-points to the receiving apparatus in a screened hut at the centre of the system. The hut was raised about 20 ft above the ground. Measurements were made simultaneously on this apparatus and on an ordinary single-coil direction-finder. The most serious night variations observed were for the transmissions from Bournemouth and Cardiff. In the latter case the single-coil method gave a rotation of apparent bearing through more than 360°, while on the Adcock system the extreme variation was 14°. From these results it is concluded that lateral deviation plays a negligible part in producing large and variable night errors, as are obtained on single coils, and that these errors are entirely due to the arrival of downcoming waves polarised with the electric force horizontal. The slight residual errors with the Adcock system (up to ±7°) may be caused by a slight imperfection of balance of the upper and lower halves, or it may actually be a residual amount of lateral deviation. In an appendix to the original paper ADCOCK describes some early observations on aircraft with the four-aerial direction-finder. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f- Experiment and theory)

408. FRIIS, H. T., AND BRUCE, E., "A Radio Field Strength Measuring System for Frequencies up to 40 Megacycles," Proc. IRE, vol. 14, pp. 507-519; August 1926. ABSTRACT: This paper describes field strength measurement sets for frequencies as high as 40 megacycles. The apparatus is a double-detection receiving set which is equipped with a calibrated intermediate-frequency attenuator and a local signal comparison oscillator. The local signal is measured by means of the intermediate-frequency detector, which is calibrated as a tube voltmeter. The completed system is capable of giving the absolute field strength of a received signal within 20% of its true value. Comparative signal measurements can be made with an error of not more than 5%. The prevalence of fading at the high frequencies make these degrees of accuracy quite ample. (a-3, b-1, c-1, d-1, e-0, f-Experiment)

409. BREIT, G., AND TUVE, M. A. "A Test of the Existence of the Conducting Layer," Physical Review, vol. 28, pp. 554-575; September 1926. ABSTRACT: A method previously proposed for a test of the existence of ionization in the upper atmosphere has been developed, and a definite proof of the existence of echoes from the upper regions has been obtained. The echoes are present for 70-meter waves with an 8 mile base near Washington, D. C. The effective height of the layer is between 50 and 130 miles. At times multiple reflections are present. Radio fading is shown to be not only an effect of interference between the ground and the reflected waves, but also to a large extent an effect of the presence or absence of reflected waves. A seasonal variation in the effective height between summer and fall seems to exist. A smaller diurnal effect is also suspected. The height seems greater in the fall than in the summer and greater in the afternoon than in the morning. Effects of wavelength and of location have been studied. A quantitative discussion of the results enables one to eliminate too gradual distributions of electron density. The measured retardation is shown to correspond to a height greater than the actual by amounts differing for various polarizations of the refracted waves. (a-1, b-1, c-1, d-1, e-0, f-Experiment and theory)

410. HOLLINGWORTH, J., "Polarisation of Wireless Waves," Nature, vol. 118, p. 409; 18 September 1926. ABSTRACT: In a previous paper, the author has referred to intensity variations at medium distances on long-wave reception during sunset. Recent experiments have shown that the cycle given on 14,350 metres at Slough from Sainte Assise (U. F. T.) is accompanied by a directional variation of the same form. Measurements were made to see if any quantitative deductions could be made: (a) In the plane of propagation; (b) in a vertical plane at right angles to this; and (c) in an intermediate plane. In some cases (a) actually exceeded (b). In the general case of elliptic polarisation there is no further solution, but by making the assumptions (1) that second reflections are not present, and (2) that waves reflected from upper layers remain plane polarised but with the plane of polarisation rotated, it is possible to deduce figures from this rotation and for the coefficient of reflection. Observations at Slough and Exeter show that during sunset a rapid rise in the reflection coefficient occurs and a rotation of the plane of polarisation of at least 90°. Whether the assumptions are justified or not it emerges that (1) long waves as well as short are polarised by refraction in the upper atmosphere at night, and (2) the effect persists all night, and consequently cannot be caused by a mere shifting of the reflecting surface through ionic recombination at sunset. Further experiments are in progress. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

411. DUNMORE, F. W., "A Portable Radio Direction Finder for 90 to 7700 Kilocycles," U. S. Bureau of Standards - Science Papers, no. 536, pp. 409-430; 21 October 1926. ABSTRACT: Describes instrument with but two controls (balancing and tuning) which operates over frequency band from 90 to 7700 kilocycles; it is simple rotating-coil type. (a-3, b-3, c-1, d-1, e-0, f-Description)

412. MALGOM, G., "Radio Direction Finders and Their Applications," Genie Civil, vol. 89, pp. 272-276, 294-297; October 1926. ABSTRACT: The article describes the principle of D/F with movable and with fixed loops. The two-loop Bellini-Tosi system, the Marconi, and the Maritime systems are discussed. The author points out their applications to aerial navigation, their use as an aid in meteorological studies, and their wartime applications. (a-6, b-1, c-3, d-3, e-0, f-Description)

413. GOUINET, M., "Note on the Calculation of the Error Curve of a Radiogoniometer in a Mercantile Ship," L'Onde Electrique, vol. 5, p. 553; October 1926. ABSTRACT: The author points out that when Mesny's formula is applied to calculate the quadrantal errors of a D/F system installed on a large liner the results are not in agreement with the observed values. If, however, a correction is made to allow for the large superstructure of a passenger ship as compared with a warship, then the formula once more gives results in very close agreement with the observed deviations. (a-3, b-1, c-3, d-3, e-0, f-Theory)

414. TATARINOFF, W. W., "Construction of Radio Reflectors," Zeit. f. Hochf., vol. 28, pp. 117-120; October 1926. ABSTRACT: The author shows that for a simple antenna the best position for the reflector (a tuned wire) is at a distance of $r = 0.2\lambda$ behind it. The case is then investigated of a complex antenna consisting of two Lecher systems, at the potential antinodes of which are placed four vertical antennae. Three reflectors are investigated, consisting respectively of (1) four wires identical with the vertical antenna wires, (2) a grid of 40 thin vertical wires of length $1/2\ \lambda$, short-circuited at the top and bottom, and (3) a plane sheet of tin foil. The grid reflector is not so efficient as the other types, in which cases the best value of r is found to be again 0.2λ. The parabolic reflector is also discussed. (a-3, b-1, c-4, d-4, e-0, f-Experimental theory)

415. CARSON, JOHN R., "Waves Propagation in Overhead Wires with Ground Return," Bell System Tech. Journ., vol. V, pp. 539-554; October 1926. ABSTRACT: A mathematical analysis of wave propagation in ground-return circuits with formulas for calculating inductive disturbances in neighboring lines. The analysis is basic to the ground return Beverage antenna particularly at low frequencies and relatively high conductivity. The solutions presented become less accurate as the frequency is increased. (Later papers by Wise include the effect of dielectric constant, see no. 821.) A minor error exists in Figure 2 of the original reprints which may affect mutual impedance calculations based on the analysis. The error may be corrected by redrawing the curve $\theta = \pi/2$ at its proper location using equation (32). Carson shows that for the wave antenna (Beverage antenna) a 100-fold increase in ground resistivity increases "the ground return impedance by the factor 2.5 and increases its reactance only fivefold." (a-4, b-1, c-1, d-1, e-456, f-Basic theoretical analysis)

416. MARCONI, G., "Radio Communications," Engineering, vol. 122, nos. 3172 and 3173, pp. 543-544 and 587; 29 October and 5 November 1926. See also Engineering, vol. 142, no. 3694, pp. 466-467; 29 October 1926. ABSTRACT: Review of developments; first beam experiments carried out in Italy and England. Lecture delivered to Instn. of Civ. Engrs. (a-3, b-2, c-1, d-5, e-0, f-Survey)

417. BOUTHILLON, L., "Radio Direction Finders and Radio Beacons with Accentuated Maximum," Comptes Rendus, vol. 183, pp. 955-957; November 1926. See also Wireless Engineer, vol. 4, p. 118; February 1927. ABSTRACT: A theoretical treatment of the direction finder consisting of a radial arrangement of antenne, each connected to the fixed member of a pair of coils. The movable members are in cascade with the fixed members, and by this arrangement the signal strength is a maximum when the plane of the wave received is the same as that of the movable coils, the latter being supposed to rotate together so that they always remain parallel to one another. The relation between the sensitivity and the number of coils is determined for the general case. (a-3, b-1, c-3, d-3, e-0, f-Theory)

418. HANCOCK, W., "Direction Finding Underground by Wireless," Colliery Eng., vol. 3, no. 33, pp. 499-503; November 1926. ABSTRACT: Possibilities of wireless to supplement ordinary survey work. (a-3, b-1, c-1, d-5, e-0, f-Theory)

419. LEXOUX, C., "Method and Apparatus to Find Easily a Fix when Two Directions Are Given," Comptes Rendus, vol. 183, pp. 1029-1030; November 1926. ABSTRACT: The apparatus described is suitable for use on aircraft, where small space, vibration and the necessity for rapid location of position practically exclude processes involving the use of large charts, apparatus of geometric construction, or numerical calculations. The apparatus makes use of two pairs of logarithmic scales, one of each pair carrying in addition a scale of logarithmic tangents and the other a scale of natural tangents. If two transmitting stations A and B are observed, suitable manipulation of the two pairs of scales to obtain a double coincidence enables the location of the aircraft to be determined from the known positions of the stations A and B. In practice the scales are engraved on the edges of four circular discs 13 cm in diameter, each pair of which can be secured so as to rotate together independently of the other pair. The accuracy obtainable is such that with stations not more than 300 km distant the error in location does not exceed about 300 m. (a-3, b-1, c-3, d-3, e-0, f-Description)

420. BENNDORF, H., "On the State of Ionization and Conductivity of the Upper Layers of the Atmosphere Brought about by the Hess Vertical Radiation," Phys. Zeits. 27, pp. 686-692; 1 November 1926. ABSTRACT: Expressions are developed to determine the number of ions per cc and the conductivity at any height in the atmosphere in terms of the measured values at the earth's surface. Consideration is given to the dependence of ionisation, mobility of the ions and the conductivity on the density of the air and also to the effect of temperature changes. Taking a mass absorption coefficient between the limits 2.2×10^{-3} and 4.5×10^{-3} cm^2/gm for the cosmic radiation, the ionisation and conductivity produced by it at different heights are tabulated. Three separate regions are considered: (1) in the lowest the negative electric carriers are the normal ions; (2) in the next they are partly normal ions and partly electrons; and (3) electrons only. The

differences existing in these regions are discussed. It is found that the conductivity (for direct current) at a height of 100 km acquires a value 10^{10} times that at the earth's surface, the air at this height conducting as well as dry earth. At 70-80 km (Heaviside layer) a rapid increase of conductivity occurs, while the calculated and observed values at 9 km agree very well. This provides an explanation of the presence of strong ionisation in the air and also of the large values found at night from experiments on the propagation of electric waves. (a-3, b-1, c-4, d-4, e-0, f-Theory)

421. KORSHENEWSKY, N. von, "A Cause of the Alteration of the State of Polarization of Short Waves," Zeit. f. Hochf., vol. 28, p. 184; December 1926. ABSTRACT: An explanation is advanced of the variation of the state of polarisation of short electric waves based on differences of refraction and reflection of the parallel and perpendicular components of the oscillation. Rotation of the plane of polarisation is shown to be possible if the oscillation direction is inclined to the plane of incidence at an angle between 0 and 90°. Explanations are also given of the way in which amplitude and phase changes may arise. (a-3, b-1, c-4, d-4, e-0, f-Theory)

422. APPLETON, E. V., AND BARNETT, M. A. F., "On Wireless Interference Phenomena between Ground Waves and Waves Deviated by the Upper Atmosphere," Proc. Roy. Soc., vol. 113, pp. 450-458; 1 December 1926. ABSTRACT: This paper deals with interference phenomena between ground waves and waves deviated by the upper atmosphere. The experimental methods used have been described previously. Photographic records were obtained of interference "fringes" with waves of 350 to 400 m, the interference being produced by waves travelling along the ground and those deviated by the ionised layer in the upper atmosphere. From the records the relative magnitudes of the effects of the atmospheric and ground waves and the resolving power of the equivalent optical system can be simply deduced. The variations in resolving power throughout the night and daybreak periods have been studied and interpreted in terms of the variations of the equivalent height of the layer. The observations show that the equivalent height gradually increases throughout the night, but that about half an hour before sunrise its value falls rapidly. At about the same time the secondary maxima and minima on the main interference fringes disappear. As the morning proceeds the atmospheric ray is gradually reduced in intensity and finally disappears. The experiments were carried out at Peterborough on transmissions from Bournemouth and Teddington. (a-3, b-1, c-1, d-5, e-0, f-Interference study)

423. RUTHERFORD, E., "Electric Waves and Their Propagation," Nature, vol. 118, pp. 809-811; 4 December 1926. Paper read before the Roy. Soc., November 1926. ABSTRACT: A short historical account is given of the development of present-day knowledge of electric waves, their properties, applications and propagation. Reference is also made to various researches having a direct bearing on the propagation of both short and long electric waves. (a-3, b-1, c-1, d-5, e-0, f-Review)

424. SOMMERFELD, A., "The Propagation of Waves in Wireless Telegraphy," Ann. d. Physik, vol. 81, pp. 1135-1153; 11 December 1926. ABSTRACT: The author summarises his previous work on this subject, together with that of Hoerschelmann. He also investigates the dual problem of magnetic horizontal and vertical antennae, and obtains formulae for short-distance propagation of surface waves and the directional effect of the latter. The paper is mathematical and cannot usefully be abstracted. (a-3, b-1, c-4, d-4, e-0, f-Theory)

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425. DUCKERT, P., "On the Influence of Atmospheric Conditions and on Its Actual Condition in Direction-Finding," Mitt. Aeron. Obs. Lindeburg, vol. 123; 1927. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

426. FISCHER, F. A., "The General Progress of the Auxiliary Antenna; Requirements in Case of Shipboard Bearing Compass," Ann. d. Hydrogr., vol. 55, p. 155; 1927. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

427. KEEN, R., Wireless Direction Finding, London, Iliffe & Sons, Ltd, 2nd Edition; 1927. ABSTRACT: Among the systems described are the Bellini-Tosi, the Adcock and conventional loop types. Both marine and aeronautical applications are covered. Four chapters are devoted to D/F in aircraft while rest cover ground stations, maps, nautical astronomy, position finding polarization error effects, and night effect. The book has been kept simple for the layman's use. (a-3, b-6, c-1, d-5, e-0, f-See also the 3rd Edition Abstract, see No 1029, and 4th Edition Abstract No. 2722)

428. LONG, S. H., Navigational Wireless, Chapman & Hall; 1927. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

429. FISCHER, F. A., "Taking Bearings on Rotating Fields with Loop and Auxiliary Antenna," Zeit. f. Hochf., vol. 30, pp. 23-25; 1927. See also Wireless Engineer, vol. 4, p. 698; November 1927. ABSTRACT NO. 1: A mathematical investigation of how a loop and auxiliary antenna may be used together to take accurate bearings on a rotating electromangetic field. The auxiliary antenna is used for coupling in a small amount of signal 90° out of phase with the loop voltage; the effect is that of clearing up the minimum. ABSTRACT NO. 2: A historical reference to the work of Rose and Barfield on wave-interference errors, and also the work of Heiligtag on the same. Discusses the Telefunken null-clearing system. Explains how the loop and auxiliary antenna respond to a rotating field. A clear minimum in an incorrect direction is obtained, and it is not possible to tell the magnitude of the directional error. (a_1-6, a_2-6, b-1, c-4, d-4, e-0, f-Theory and review)

430. FISCHER, F. A., "Further Development of the Quadrantal-Error Theory," Telefunken-Zeitung, vol. 8, pp. 63-66; 1927. See also Wireless Engineer, vol. 4, p. 699; November 1927. ABSTRACT: The general equation for quadrantal errors is given. It is found that while a ship's listing generally reduces quadrantal errors, its inclination lengthwise increases it. An important result of the investigation for loop compensation theory is that a loop compensates independently of the frequency when it has the same natural oscillation and the same damping as the ship. (a-6, b-1, c-4, d-4, e-0, f-Theory)

431. MICHELSSEN, F., "Taking Bearings with a Loop on Short Waves," Telefunken-Zeitung, vol. 8, p. 66; 1927. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

432. MICHELSSEN, F., "Contribution to the Compensation of the Antenna Effect in Direction Finders," Telefunken-Zeitung, vol. 8, p. 71; 1927. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

433. NITZSCHE, D., "Finding the True Direction of a Radio Ray with a Land Direction Finder," Telefunken-Zeitung, vol. 8, pp. 72-78; 1927. See also Exper. Wireless, vol. 4, p. 699; November 1927. ABSTRACT: Discusses use of calibration curves of site error and gnomonic-projection charts for finding true bearings over reasonably long distances. Gives example of calculation in absence of gnomonic-projection chart. (a-6, b-1, c-4, d-4, d-0, f-Theory)

434. MICHELSSEN, F., "On the Possibility of Taking Short-Wave Bearings at Sea by Day and Night," Telefunken-Zeitung, vol. 8, pp. 96-99; 1927. See also Exper. Wireless, vol. 4, p. 699; November 1927. ABSTRACT: Details are given which lead to the conclusion that bearings on short waves are not practicable. Some investigational uses for short wave D/F's on shipboard are pointed out. (a-6, b-1, c-4, d-4, e-0, f-Experimental results)

435. APPLETON, E. V., "The Existence of More than One Ionized Layer in the Upper Atmosphere," Nature, vol. 120, p. 330; 1927. ABSTRACT: During the past year and a half systematic observations have been made at this station on the characteristics of wireless waves deviated by the upper atmosphere. These observations, which have been made as part of the programme of the Radio Research Board of the Department of Scientific and Industrial Research, were begun in collaboration with Mr. M. A. F. Barnett and have more recently been continued with Mr. J. A. Ratcliffe's assistance. As part of such routine measurements many determinations of the equivalent height of the Kennelly-Heaviside layer have been made, utilising special transmissions from the National Physical Laboratory and from the stations of the British Broadcasting Company. The early summer observations of 1926 showed that the night-time height of this deviating layer, for wave-lengths of 400 metres, was usually 90 km to 130 km. During the period October 1926 - May 1927, however, heights of an entirely different order of magnitude, namely, 250 km to 350 km, have been frequently measured during the three hours before dawn. On such occasions, after the high values have been recorded for two or three hours, a discontinuity in the series of values occurs 30 to 40 minutes before sunrise, and heights of the normal value are again recorded.

The experimental evidence, the detailed discussion of which will appear shortly, leaves little doubt that on such occasions, in the period before dawn, the ionisation in the Kennelly-Heaviside layer has been sufficiently reduced by recombination to permit of its penetration by waves of this frequency. Reflection, however, takes place at an upper layer which is richer in ionisation. With the advent of sunrise at a height of 100 km or so, the Kennelly-Heaviside layer is formed again and deviation by the lower layer is suddenly established, the normal fall of the under boundary of the latter proceeding afterwards as the more direct solar influence increases the region ionised. As the day further proceeds, the experimental results suggest that another region of ionisation is formed below the Kennelly-Heaviside layer, which, while causing attenuation of the waves, does not very materially affect the height at which they are deviated. The obvious bearing of these results on the nature of the solar radiation responsible for atmospheric ionisation and their correlation with the results of terrestrial magnetism must await a more detailed discussion. There is, however, one small point which may be mentioned here. It seems of interest in indicating the possibility that simultaneous observations between the same two stations on widely different wave-lengths might enable us to study the characteristics of both layers at the same time. Since ultra-short waves require a greater electron concentration to deflect them back than do the longer waves, there may not be enough electrons in the Kennelly-Heaviside layer to send back the former, so that for angles of incidence less than a certain amount (e.g., in short distance transmission), such wave-lengths would be deviated by the upper layer at all times of the day. The relatively large amplitude of the ray returned from the upper layer in the experiments mentioned above, in which 400 metre waves were used, demonstrates the low attenuation consequent on deviation at such great heights, so that with ultra-short waves the greater part of the absorption would probably take place in the penetration of the lower layer. Thus, even for transmission over long distances, we might expect a higher ray path, and deviation at the upper layer would result in less resultant absorption than a low ray path with deviation at the Kennelly-Heaviside layer. It may be mentioned in this connexion that the American determinations of the heights at which these ultra-short waves are "reflected" fit in with the above ideas of their deviation at the upper layer. (a-1, b-1, c-1, d-5, e-0, f-Experiments and theory)

436. SMITH-ROSE, R. L., "A Study of Radio Direction Finding," Radio Research Special Report No. 5 dated 1927; Department of Scientific and Industrial Research, London, England. See also Wireless Engineer, vol. 5, p. 151; March 1928. (See also previous R.R.D. reports 1 through 4). ABSTRACT NO. 1: A report dealing with the effects of local conditions on direction finder bearings including extensive investigations on coastal deviations in the medium frequency range, local deviations due to terrain variations and miscellaneous site discontinuities such as buildings, metallic lines, railroad tracks and buried conductors. The essential conclusions of this report have been summarized in NRL Report No. R-1938 by Goldstein dated 19 September 1942, see Abstract No. 1538. ABSTRACT NO. 2: This summarises the progress made in investigations on radio direction finding during the last five years. In summer, in the U. K. latitudes, the observed bearings in daylight are fairly constant, and with the exception of permanent errors, approximate quite accurately to the true geographical bearings. Under certain conditions, this accuracy is maintained at all times and seasons; otherwise the observed bearings show signs of variable errors as sunset approaches the transmission path. These prevail throughout the night, but decrease to a negligible extent soon after sunrise. When the path of transmission is entirely over sea, the observed bearings should be accurate at distances which are usually less than 50 miles and never greater than 100 miles. Over similar distances, the variations experienced on 2000-9000 m are of the same order as those of higher wave-lengths, the actual variation amplitudes decreasing considerably for a range of 3000 miles. The theory of night errors is finally given. (a_1-4, a_2-3, b-3, c-1, d-5, e-0, f-Coastal deviation error study)

437. SACKLOWSKI, A., "The Propagation of Electromagnetic Waves," Elek. Nachrichten., vol. 4, pp. 31-74; January 1927. ABSTRACT: The author reviews the information collected on this subject, discussing the most important contributions and referring to others. Regarding field-strength measurements, the methods and results of Austin, Hollingworth, Friis, Round and Lunnon, Anders and Vallauri are described, and conclusions are given regarding the influences of the sun of diurnal and annual fluctuations, of solar eclipses and of meteorological conditions. The propagation of long and medium waves are discussed, a suitable formula is given, and the propagation of short waves, fading phenomena, polarisation and directional reception are also examined. The last section of the paper gives the theory of electromagnetic wave propagation (1) without the assumption of a conducting layer, with a plane or curved earth of perfect of imperfect conductivity, and (2) with the assumption of this layer, with and without regard to the earth's magnetic field. A comprehensive bibliography of the subject is appended. (a-3, b-1, c-4, d-4, e-0, f-Review and theory)

438. APPLETON, E. V., "The Heaviside Layer," Wireless World and Radio Review, vol. 20, pp. 2-4, 5 January 1927. ABSTRACT: A simple description of the experiments carried out by the author demonstrating conclusively the high angle reflection of wireless waves. It is shown that the ratio of magnetic force to electric force for a downcoming wave with its associated reflected wave is greater than for a horizontally travelling wave. This ratio is determined by simultaneous fading measurements on a loop aerial and vertical aerial. The results indicate the height of the reflecting layer to be of the order of 80 to 100 kilometres. (A-3, b-2, c-1, d-5, e-0, f-Experiments)

439. BOUTHILLON, L., "Inclination of Waves and Directed Systems," Comptes Rendus, vol. 184, pp. 190-192, 24 January 1927. ABSTRACT NO. 1: Describes an elementary directive antenna array. ABSTRACT NO. 2: Grating antennae, such as that of the Marconi station at Bodmin, are considered mathematically, and calculations of the antenna patterns are given. (a_1-6, a_2-4, b-1, c-3, d-3, e-0, f-Theory)

440. MESNY, R., "Directional Emission by a "Gree-Fret Antenna," Onde Elec., vol. 6, p. 181; February 1927. ABSTRACT: Description of a "fretwork" antenna as a directional radiator. A theoretical treatment of the subject is given. Describes directional emission by Curtain antenna in the form of a Greek key pattern. (a-6 and 4, b-1, c-3, d-3, e-0, f-Theoretical analysis and experimental study)

441. BUSIGNIES, H., "The Hertzian Compass," Radio Revue, pp. 309-319; March 1927. See also Wireless Engineer, vol. 4, p. 372; June 1927. ABSTRACT: Preliminary description of a radio compass consisting of a pointer attached to an armature rotating in the field produced by two perpendicular loops (goniometer). (a-6, b-1, c-1, d-5, e-0, f-Description)

442. LAFORGE, L., "Meteorological Direction-Finding," QST Francais, vol. 8, pp. 56-62; March 1927. ABSTRACT: A discussion of meteorology and a brief mention of a D/F for taking bearings on atmospherics. (a-6, b-2, c-3, d-3, e-0, f-Description)

443. BLONDEL, A., "On Methods of Taking Bearings and Direction-Finding Employing Hertzian Waves and Directive Radio Beacons," Comptes Rendus, vol 184, pp. 561-565; 7 March 1927. See also Wireless Engineer, vol. 4, p. 372; June 1927. ABSTRACT NO. 1: Article described a D/F method employing elementary lobe-switching. Two curtain arrays are mounted at an angle of 20-30° with respect to to each other, and the arrays are alternately excited. ABSTRACT NO. 2: A brief description is given of several methods of obtaining directed wireless short-wave beams by the use of vertical aerials spaced at some definite fraction of a wave-length apart and supplied with energy in definite phase relations. A new system is also described in which a single oscillator is connected in turn to two aerials by means of an automatic commutator. The paper concludes with a brief account of arrangements using waves of from 5 to 10 m and of their application for navigational purposes. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theory)

444. LE MARQUAND, H., "Radio and Aerial Routes," Q.S.T. Francais, vol. 8, p. 69; March 1927. ABSTRACT: Description of the necessary equipment in an aircraft. Description of the internal organization, in France, of radio networks which can be used to help aerial navigation. (a-6, b-2, c-3, d-3, d-0, f-Description)

445. BLONDEL, A., "Radio Beacons," Comptes Rendus, vol. 184, pp. 721-724; 21 March 1927. ABSTRACT: This paper gives a general discussion of the application of the types of directive wireless systems previously described in Abstract No. 443 to the construction of rotating radio beacons. (a-3, b-1, c-3, d-3, e-0, f-Description)

446. FISCHER, F. A., "The Reradiated Field of an Elevated Antenna and Its Dependence on the Frequency," Elekt. Zeits., vol. 48, pp. 39? 397; 24 March 1927. ABSTRACT: The reflected field of a high antenna can be split up into two components, one in phase and the

other at 90° with the received wave. The latter requires an auxiliary antenna for its compensation, and is present when the antenna is detuned, but when tuned the former only is present, producing a pure deviation. (a-3, b-1, c-4, d-4, e-0, f-Theory)

447. DUNMORE, F. W., "Portable Radio Direction Finder for 90 to 7,700 Kilocycles," National Bureau of Standards, Science Papers, vol. 21, Paper No. 536, p. 409; April 1927. See also Wireless Engineer, vol. 4, p. 247, April 1927. ABSTRACT: Description of the development of a portable direction finder having but two controls - balancing and tuning - and using plug-in coils. A cam operates an auxiliary condenser for automatic compensation of detuning. (a-6, b-1, c-1, d-1, e-0, f-Description)

448. BLONDEL, A., "Directed Wireless Transmission," Comptes Rendus, vol. 184, pp. 923-925; 11 April 1927. ABSTRACT: In a previous note a description was given of a method of exciting alternately or simultaneously, by means of an oscillating inductor, two antenna systems giving emissions constantly opposed in phase, each antenna system forming a sort of screen lying in one plane. Two such systems are arranged so that the angle between the normals to the planes containing each system is less than half the angle between the tangents to the figure - 8 characteristic curves for each system. Instead of the systems with multiple antenna elements, two squares may be employed, each consisting of two antennae with a phase difference of half a wave-length and spaced half to three-quarters of a wave-length apart. These are arranged so that the squares intersect on the vertical median common to both and can be excited by a two-coil variometer. (a-3, b-1, c-3, d-3, e-0, f-Description)

449. SMITH-ROSE, R. L., "A Sensitive Long-Wave Radio Direction Finder," Journ. Sci. Instruments, vol. 4, pp. 252-262, May 1927. ABSTRACT: A description is given of a single-frame, coil-type of direction finder constructed for the purpose of taking wireless bearings on transmitting stations of wave-lengths from about 5000 to 20,000 metres at distances of several thousand miles. To avoid the spurious emf's introduced by the "antenna effect" and "direct pick-up," a whole hut containing the direction-finding receiver is placed within a screen consisting of plane, vertical, unclosed loops; the amplifier and audio-frequency filter are also discussed. Observations are made at distances of 3000 to 4000 miles, with an arc of silence not exceeding two degrees. (a-3, b-1, c-1, d-5, e-0, f-Description)

450. VIVIE, J., "Radio Direction-Finding and Aircraft," Q.S.T. Français, vol. 8, pp. 77-84; May 1927. ABSTRACT NO. 1: Subjects discussed include: description of a D/F for use in aircraft; theory of loop reception; assymmetry in the D/F. Reradiation, dispersion, and deviation from the great circle path are the principal sources of error. The sense antenna and the use of a fixed loop are described. ABSTRACT NO. 2: The author first described two aircraft radio installations, and gives the theory of the radiogoniometer. The causes of error - viz. dissymmetry of the instrument, existence of natural obstacles near the frame and deviation of the waves - are discussed, brief consideration also being given to goniometers with fixed frames. The author concludes by pointing out the applications of radio to aviation. (a_1-6, a_2-3, b-2, c-3, d-3, e-0, e-0, f-Description)

451. CAIRNS, J. E. I., "Experimental Confirmation of the Influence of a Low-Resistivity Layer Subsoil on the Forward Inclination of Radio Waves," J. Washington Acad. Sci., vol. 17, pp. 264-269; 19 May 1927. ABSTRACT: Experiments showed that radio waves of length 1250 metres had no inclination when travelling over soil which consisted of a layer of sand of an exceptionally high resistivity over a layer at no considerable depth of very low resistivity. The actual resistivity of the soil had been measured in situ down to a depth of some 60 to 100 metres. The result thus obtained is regarded as being more definite proof than has hitherto been given of the effect of ground water or a low resistivity layer a short distance below the surface, owing to the greater precision of the resistivity measurements of the undisturbed soil. (a-3, b-1, c-1, d-1, e-0, f-Experimental)

452. ESAU, A., "Loop and Goniometer Arrangements for Taking Bearings," Zeit. f. Hochf., vols. 29-30, pp. 181-190, 15-23; June/July 1927. See also Exper. Wireless, vol. 4, pp. 697-698; November 1927. ABSTRACT NO. 1: A comparison of three antenna arrangements (frame, double antenna and "V") with respect to errors produced by wave tilt and non-vertical polarization, followed by an analysis of the effects of the above on crossed loop and goniometer systems. Finally, the author claims that 2 pairs of non-directional antennas at right angles to one another suffer error from either "tilt" or polarization provided the ratio spacing / wave-length is small (less than 1/10). Furthermore, if the pairs are not at exactly right angles, the error introduced is the same as in goniometers with stators not at right angles. ABSTRACT NO. 2: With frame antennae, errors are introduced when the waves are not incident normally to the plane of polarisation; for double and V-antennae, correct bearings are given when the bearing distance is less than the wave-length. The goniometer with cross loops gives correct bearings in the case of horizontal wave incidence or normal polarisation, but otherwise errors occur, depending upon the angle of incidence of the rays and the angle of deviation of the polarisation plane from the normal. If the loops or field coils are not at 90°, errors also arise except when the angle of incidence is 90° in the first case and zero in the second; the errors in these two cases are of opposite sign. A difference in the sizes of the loops also gives rise to bearing errors, reaching a maximum for an angle of incidence of 45°. The concluding part of the paper discusses the problem of goniometers consisting of non-directive antennae, and also shows that the observations of Buchwald and Baldus indicate the same difference between the various antenna forms as the calculations in this paper. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Experiments)

453. ECKERSLEY, T. L., "Short-Wave Wireless Telegraphy," JIEE, vol. 65, pp. 600-638; Disc., 638-644; June 1927. See also Abstracts in Experimental Wireless, vol. 4, pp. 213-222; Disc., pp. 222; April 1927; El. Rev., vol. 100, pp. 996-997; 17 June 1927. transmission and reception of short waves, which throw light on the nature of the transmission as well as on the practical question of the design of suitable aerials for short-wave working. The first section deals with aerial transmission characteristics. The vertical polar radiation diagrams of various types of aerials are computed, taking account of the earth's resistivity, and it is shown that these are all characterised by the absence of horizontal radiation. This follows from the expression derived for the field of a radiating doublet, which shows that at great distances the field is given by that due to the doublet itself and that due to the negative image of the doublet at a depth equal to the height of the doublet above the earth's surface. It is also shown that the intensity of the low-angle transmission is increased by raising the transmitting aerial. The second section presents the results of a long series of experiments in which a short-wave direction finder was used, and the conclusion is reached that in long-distance transmission the ray trajectory has a shallow angle of elevation of about 15° and follows the great-circle path. The third section describes a series of long-distance transmission experiments with wave-lengths between 10 and 25 metres. The results obtained indicate the superiority of a raised doublet over one at the ground level. In the last section the general theory of ionic refraction is discussed in the light of these and other experimental results. The effect of attenuation due to the collision of electrons with molecules is especially stressed, and a novel theory of the skip distance is put forward which is in close agreement with the observations of Heising, Schelleng, and Southworth. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

454. BUSIGNIES, H., "Indicating Apparatus from Which the Direction of a Wave Can Be Read Off Immediately," Onde Elec., vol. 6, pp. 277-303; July 1927. ABSTRACT: The author points out the differences of application between a radiogoniometer and a "radiogalvanometer." The latter consists of two identical receiving frames placed mutually at right angles in a magnetic field, each being connected to an amplifier detector; the amplifier outputs are connected respectively to two identical mutually perpendicular galvanometer coils, pivoted in a magnetic field. The theory of the arrangement is given, and its sensitivity and errors are discussed. The principle of the goniometer is dealt with, as well as the applications of both types of apparatus to aerial navigation. (a-3, b-1, c-3, d-3, e-0, f-Description)

455. MICHELSSEN, F., "Reports on the Actual Situation of Direct-Reading Direction-Finding Apparatus," D.V.L. Berichte; July 1927. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

456. ROESSLER, E., "Propagation of Electromagnetic Waves along Wires," Elek. Nachrichten., vol 4, pp. 281-295; July 1927. ABSTRACT: If the ratio of the wave-length to the distance between the conductors of a double line is increased, the telegraph equation finally loses its validity, radiation taking place. Hitherto the mathematical treatment of this subject has assumed infinitely long conductors, but it is shown that this assumption is inadmissible, the theoretical results so obtained deviating considerably from the values obtained experimentally; this deviation can be shown on Lecher wires or high-voltage conductors of the usual dimensions. The telegraph equation can, however, be put in a more general form, which is developed and applied to the case of an antenna. (a-3, b-1, c-4, d-4, e-0, f-Theory)

457. APPLETON, E. V., AND RATCLIFFE, J. A., "On the Nature of Wireless Signal Variations. Parts I and II," Roy. Soc Proc., vol. 115, pp. 291-317; 1 July 1927. ABSTRACT: The present two papers give further results obtained by similar but improved methods to the two previously described. The mean values of the angle of incidence for the periods immediately following sunset and preceding sunrise, as measured by these two methods, show a close agreement, and lead to an effective height of 90-100 km for the atmospheric deflecting layer. A diurnal variation in the height of the ionised layer, which is found to be higher in the middle of the night than during the sunset and sunrise periods, is indicated. The comparatively rapid fluctuations in the angle of incidence of downcoming waves are not considered as being due to height variations of the ionised layer, but are explained by supposing that "reflection" takes place at different points on a layer of the mean height of which is sensibly constant. Such variations might be expected if the layer were not of sensibly uniform horizontal stratification. Fading may be due to changes in any of the following variables which determine the nature of the downcoming waves: (a) angle of incidence, (b) intensity, (c) phase, (d) polarisation. For wave-lengths of about 400 m and distances of about 80 miles fading is due chiefly to changes in the intensity. Variations in the phase relation between the ground and sky waves are a secondary cause of fading. Changes in the angle of incidence or polarisation are not responsible in any very marked degree for signal variations. The downcoming ray has been shown to be of complex polarisation, having electric vectors both in and at right angles to the plane of propagation. Similar intensity variations are found in both these vectors. The use of a suppressed atmospheric ray system in reception for minimising fading and in transmission for preventing the emission of upward rays is discussed. Such a system may be used to find the angle of incidence of downcoming rays in the absence of direct rays. (a-3, b-1, c-1, d-5, e-0, f-Experimental study and qualitative theoretical analysis)

458. CARSON, J. R., AND HOYT, R. S., "Propagation of Periodic Currents over a System of Parallel Wires," Bell System Techn. J., vol. 6, pp. 495-545; July 1927. ABSTRACT: The first section of this paper is devoted to the formal mathematical theory of the propagation of periodic currents over a system of parallel wires energised at its physical terminals only. The theory developed is essentially a generalisation of the classical theory of transmission over a single wire (with ground return) or over a balanced metallic circuit. The solution given furnishes the fundamental formulae and a good deal of information regarding what takes place in a system of parallel wires; for actual calculations, however, the method of treatment is not so well adapted as that developed in the remaining sections of the paper. The second section deals analytically with the problem of propagation over a line or a circuit exposed throughout its length to an arbitrary impressed field of force. The resulting solution is immediately applicable to problems of crosstalk and interference and to the theory of the wave antenna. The last two sections are devoted to the development and application of a more physical or synthetic method of treatment, based on the substitution of "equivalent electromotive forces" for the arbitrary impressed field. This synthetic treatment, which permits of an intuitive or physical grasp of the various problems, has been found quite useful in dealing with crosstalk and interference and also with the wave antenna. The method is illustrated (in the last section) by application to two representative problems of a diverse nature. (a-1, b-1, c-1, d-1, e-0, f-Theory)

459. IMMLER, W., "Construction of an Azimuthal Chart for Determining Lines of the Same Azimuth for Small and Medium Distances from the Transmitter," Zeit. f. Hochf., vol. 30, no. 2, pp 60-66; August 1927. ABSTRACT: Not available. (a-3, b-1, c-4, d-4, e-0, f-0)

460. PESSION, G., "Propagation of Electromagnetic Waves," Elettrotecnica, vol. 14, no. 27, pp. 666-682; 25 September 1927. ABSTRACT: Theoretical principles and recent American and European progress in directed transmission of waves, beam radiotelegraphy, particularly with short waves; electro-magnetic reflectors. (a-3, b-1, c-9, d-9, e-0, f-Propagation study)

461. ANONYMOUS, "Distance and Direction Finding Through Use of Submarine Signal Apparatus," Mar. News, vol. 14, no. 5, pp. 70-71 and 78; October 1927. ABSTRACT: Submarine oscillator used in conjunction with radio beacon makes possible immediate determination of ship's position; fathometer an important development for making soundings while under full speed. (a-3, b-2, c-1, d-0, e-0, f-Description)

462. SKERRETT, R. G., "Two New and Valuable Aids to Navigation," Proc. Mar. Rev., vol. 24, no. 10, pp. 474-475, October 1927. ABSTRACT: Description of Holmes magnetic master compass and path and position indicator. (a-3, b-2, c-1, d-0, e-0, f-Description)

463. SMITH-ROSE, R. L., "Directional Wireless as an Aid to Navigation," Nature, vol. 120, pp. 774-777; November 1927. ABSTRACT: After several years of struggle with a rather conservative race of navigators, the wireless engineer and scientist are becoming successful in the application of directive wireless transmission or reception to both aerial and marine navigation; and it can now be said with some confidence that in a very few years time the wireless direction-finder, or some alternative means of navigation by wireless, will be considered as essential as a compass on board every ship of any importance. Already a considerable number of ships of all nationalities, with those of Great Britain leading the way, are fitted with a direction-finder, an instrument which enables a ship to take bearings on wireless transmitting stations and to fix its position with some accuracy at times when all other navigational methods fail. The application of wireless transmission as an aid to navigation is conveniently divisible into two parts according as the directive characteristic is applied at the transmitting or the receiving end of the wireless link. Although both forms are probably of about the same age, the directive receiver has developed the more rapidly and will thus be considered first. Stated briefly, the fundamental principle of the wireless direction-finder is the rotation about a vertical axis of a plane vertical loop or its equivalent in space. The electro-motive force induced in such a loop by an arriving stream of electro-magnetic waves is proportional to the cosine of the angle between the plane of the loop and the direction of the waves. Thus as the loop is rotated about its vertical axis the strength of the received signal varies from a maximum to a minimum or zero, in accordance with the well-known figure-of-eight polar diagram. A consideration of this diagram shows that the rate of change of signal strength with rotation is greatest at the minimum position, which is therefore always used for direction-finding. (a) Accuracy of the Direction-Finder. There are several manufactured forms of direction-finder employing the above principle, and their accuracy when used under the best conditions may be said to be about 1°. Under most practical conditions, however, the instrument is subject to certain errors in determining the direction of a distant transmitter. In part these errors may be due to an actual deviation of the waves from their rectilinear path in crossing a coastal boundary, for example, when a maximum deviation of about 5° may be produced for wave-lengths of the order commonly used in marine direction-finding. On the other hand, the errors may arise from the presence of local conditions near the direction-finder, such as trees, metalwork, and overhead wires, the currents induced in which result in secondary fields being superimposed on the primary wave field and so produce a minimum signal in a false position of the direction-finder. As a result of several years' investigation these errors are now well understood, and in most circumstances they may be avoided or compensated for after reduction to a minimum. (b) Position of the Direction-Finder. In the application of direction-finding to marine navigation, a point of some debate has been the most desirable location for the instrument, on shore or on board ship. When erected in suitable surroundings, the shore direction-finder has an accuracy superior to that of the ship installation, for in the latter case the wireless bearing is taken relative to the ship. (a-3, b-1, c-1, d-5, e-0, f-Review)

464. ESAU, A., "Increasing the Range of Reception with Double Loop and Cardioid Arrangements by Means of Goniometers," Zeit. f. Hochf., vol. 30, pp. 141-151; November 1927. See also Exper. Wireless, vol. 5, p. 226; April 1928. ABSTRACT NO. 1: Description of receiving arrangements consisting either of loops or cardioid systems, with which, by employing goniometers in the subsidiary and principle systems, reception is rendered possible from all directions and not only from that given by the base line of the antennas, as previously, without prejudicing the freedom from disturbance. The necessary condition for this is that the radio antenna-spacing/wavelength be chosen small. ABSTRACT NO. 2: A mathematical article continuing previous work on directive reception. The author derives the polar diagrams for the reception of signals with crossed frame goniometer sets in the following cases: two in a line, one at each corner of a square, the latter with a further set in the centre, each of these arrangements with separate or single open antennae. The effect of polarised, non-polarised, and down-coming waves are discussed in view of the response to atmospherics by the system. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Theory)

465. MICHELSSEN, F., "Short Waves for Direction Finding," Zeit. f. Hochf., vol. 30, pp. 183-187; December 1927. ABSTRACT: An account of research work with short waves (18-120 metres) for directional reception with a frame antenna carried out with Telefunken apparatus in 1926. Day and night tests were made. Sharp minima were obtainable with only short ranges on land, but upon open water results were

satisfactory. The errors due to the iron in ships are extraordinarily large (up to 90°), and vary considerably with frequency, and compensation is very difficult. Several peculiarities of short waves were also revealed, but it is concluded that results can only be guaranteed up to ten sea-miles. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

466. FISCHER, F. A., "Experiments on Short-wave Direction-finding, with Loop and Auxiliary Antenna, over Greater Distances over Sea," Zeit. f. Hochf., vol. 30, pp. 188-189; December 1927. See also Wireless Engineer, vol. 5. p. 226; April 1928. ABSTRACT: The author gives the results of a series of tests conducted in June, 1927, on short-wave directional transmission over the sea. The direction finder was situated on land, near the coast, while a 150-watt transmitter was erected on a ship. The tests were conducted on wavelengths of 19, 28.5, 39 and 49 metres over distances varying from 30 to 570 nautical miles, the signal strength and sharpness of the tuning being noted for each position. (a-3, b-1, c-4, d-4, e-0, f-Experiments)

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467. APPLETON, E. V., AND RATCLIFFE, J. A., "On a Method of Determining the Polarization of Downcoming Wireless Waves," Proc. Roy. Soc. Ser. A, vol. 117, pp. 576-588;1928. ABSTRACT: An experimental method of determining the polarisation constants of ellipticity of downcoming wireless waves is described. The use of the method in a series of measurements in England with 400 metre waves has shown that the downcoming waves are in general elliptically polarised and that the polarisation is approximately circular. The sense of rotation is found to be left-handed. It is shown that, according to the magnetic-ionic theory of atmosphere deflection of wireless waves, in which the influence of the earth's magnetic field is recognised, such left-handed elliptical polarisation might be expected if the electrical carriers in the ionised layer are of electronic mass, but that similar measurements made in the Southern Hemisphere would yield evidence which would very materially confirm or disprove such an interpretation. (a-1, b-1, c-1, d-5, e-0, f-Descriptive theory)

468. DUCKERT, P., "Dependence of Emissions on Atmospheric Conditions," Mitt. Aeron. Obs. Lindenberg, vol. 123; 1928. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

469. DUCKERT, P., "Shore Refraction and Variation of Direction of Electro-Magnetic Waves," Beitr Phys. Atm., vol. 14, p. 154; 1928. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

470. DUNMORE, F. W., "Tuned Reed Course Indicators for Radio Beacons," National Bureau of Standards, Research Paper No. 28, pp. 751-769; 1928. ABSTRACT: This indicator is for use on aircraft navigating by means of the radio beacon designed by the Bureau of Standards. The beacon system used is a development of the original interlocking signal beacon in which the A and N signals have been replaced by modulating frequencies. The criterion for the aircraft being on the course is that equal signals are received on the two modulating frequencies. For the purpose of conveniently indicating this, an arrangement of reeds tuned to the modulating frequencies has been devised. When the two reeds are seen to be vibrating with equal amplitude, then the pilot knows he is keeping the aircraft on the correct course. Six types of indicator were made and the operating data obtained on each type. The final model was one in which the reeds were made of steel with a bimetallic strip on the free end to give temperature compensation. The reeds are polarised by permanent magnets of the telephone-receiver type, and operate satisfactorily on an input of 1.5 milliamperes at about 3.5 volts, having a damper about 11 mm square on the end. The frequencies used lie between 50 and 130 cycles. A pair of reeds are mounted as one unit and arranged to plug into a shock-proof mounting on the instrument board. The reed units may then readily be changed as the pilot requires to make use of beacons having different modulating frequencies. (a-3, b-1, c-1, d-1, e-0, f-Desctiption)

471. HOLLINGWORTH, J., AND NAISMITH, R., "Polarization of Radio Waves," Nature, vol. 121, p. 171; 1928. ABSTRACT: In some recent work on this subject carried out for the Radio Research Board, the following interesting results have been obtained in connexion with the propagation of long waves (14,350 metres). In the course of simultaneous observations over a period from one hour before until one hour after sunrise of the same tranmission from St. Assise by two stations, Slough and Aberdeen, roughly 400 and 1000 km from it and approximately on the same great circle, it has been found that in the period preceding sunrise the wave arriving at the nearer station is plane polarised, with its plane of polarisation rotated in a clocIwise direction when looking in the direction of propagation, whereas at the more distant station the rotation is anti-clockwise. By the time of sunrise both these abnormal polarisations have gradually decreased and disappeared, and in some cases at the nearer station the space wave appears to have entirely vanished also. About half an hour later, however, the space wave reappears at the nearer station, but this time with left-handed polarisation. This persists with varying intensity throughout the day, again disappearing about 15.00 G.M.T., when the right-handed polarisation returns for the night. It has also been shown that the wave reaching the far station has started from the transmitter at practically the same angle of elevation as the wave to the near station, and that its downcoming angle at the far station is comparatively steep. Internal evidence is strongly against the idea of a twice-reflected wave, mainly because the variations of direction and intensity observed are too great to fit in with the roughly known values of the reflecting power of the layer for a single reflection; and there seems a strong probability that we are here dealing with some form of doubly refracted ray of which one element is being received at each station. The direction of transmission makes an angle of 15° with the magnetic meridian, but owing to the high value of the magnetic dip in these latitudes it is difficult to link up these results with the theoretical formulae. Further experiments on the subject are in progress. (a-1, b-1, c-1, d-5, e-0, f-Theory)

472. JOLLIFFE, C. B., AND ZANDONINI, E. M., "Bibliography on Aircraft Radio," Proc. IRE, vol. 16, p. 985; 1928. ABSTRACT: Not available. (a-2, b-1, c-1, d-1, e-0, f-0)

473. NESTEL, W., "Use of Frame Antennas in Radio Transmission," Zeit. f. technische Physik, vol. 9, no. 4, pp. 143-145; 1928. ABSTRACT: Report from laboratory of Stuttgart Institute of Technology; defines "radiation efficiency" of antennas; notes increasing radiation efficiency of frame antennas with shortening of waves; simplicity, ease of wave length, variation and other advantages of frame antennas. (a-3, b-1, c-4, d-4, e-0, f-Description)

474. SMITH-ROSE, R. L., AND CHAPMAN, S. R., "Investigation of a Rotating Radio Beacon," R.R.B. Spec. Rpt. No. 6, H.M. Stationery Office; 1928. ABSTRACT: This is an account of trials carried out over land sea of a rotating radio beacon designed and erected by the Royal Air Force at Fort Monckton, near Gosport. In general, the beacon was found to have a reliable range of fifty miles to ships' receivers, and the bearings obtained were generally correct to within two degrees. (a-3, b-1, c-1, d-5, e-0, f-Description)

475. STOWELL, E. Z., "Unidirectional Radio Beacon for Aircraft," National Bureau of Standards, Research Paper No. 35, vol. 1, no. 6, pp. 1011-1022; 1928. ABSTRACT: A method of transmitting unidirectional beacon signals for the aural or visual guidance of aircraft has been worked out. Such signals increase the efficiency of the beacon from the power standpoint, reduce interference from other beacons, and reduce the number of radiated sources to one. It is believed that the polar characteristic of the radiated field is about the optimum for aircraft use. The method consists in transmitting directive and non-directive fields simultaneously, with the proper phase and amplitude relations between them to secure unidirectional transmission. (a-1, b-3, c-1, d-1, e-0, f-Description)

476. TURLYCHIN, J. H., AND PONOMAREFF, M. F., "Combined Frame Antennas," Zeit f. tech. Phys., vol. 9, 9, pp. 357-364;September 1928. ABSTRACT: The electric field of a single frame aerial is first discussed, and the theoretical formulae derived are then applied to the case of multiple frame aerials, first without and then with a reflector. Numerous polar radiation diagrams are given, and these are compared with results obtained experimentally. (a-3, b-1, c-4, d-4, e-0, f-Analysis)

477. WATSON-WATT, R. A., HERD, J. F., AND BAINBRIDGE-BELL, L. H., The Cathode Ray Oscillograph in Radio Research, H. M. Stationery Office; 1928. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Textbook)

478. WORLLEDGE, J. P. G., "Deviations of Wireless Waves at a Coastal Boundary," Nature, vol. 121, p. 351; 1928. ABSTRACT: Not available. (a-1, b-1, c-1, d-5, e-0, f-Theory)

479. AICARDI, J., "Course Setting by Hertzian Waves," Onde Elec.,"vol. F, p. 20, January 1928. ABSTRACT: A method of a "fix"

by means of two waves, one of which is modulated, coming from two widely separated antennas is presented. The method makes use of the interference pattern of the waves. (a-6, b-1, c-3, d-3, e-0, f-Analysis)

480. FARFIELD, R. J., "The Attenuation of Wireless Waves over Land," JIEE, vol. 6, p. 204; January 1928. ABSTRACT: A simple portable apparatus was developed for the measurement of field strengths, and with this the field strength of 2LO was measured along seven radial lines up to a maximum distance of one hundred miles. The results were plotted out and curves drawn giving the overall attenuation, and from these are derived curves showing only the surface absorption effect. The attenuation is in every case greater than that predicted by Sommerfeld's theory, and furthermore varies greatly in different directions. This discrepancy is attributed to absorption due to trees. An experimental method was developed by which the energy absorbing property of a single tree could be directly measured. A correction could thus be made for the presence of trees, assuming the density of tree distribution to be approximately known. This, the author found, accounts both for the variation of attenuation with direction and for the generally greater value observed. (a-3, b-1, c-1, d-5, e-0, f-Study)

481. HYLAND, L. A., "Radio Direction Finding," Aviation, vol. 24, no. 1, pp. 30-33; 2 January 1928. ABSTRACT: Aims of radio direction finding to direct aircraft along dark airways, to determine accurately limits of airport and to effect landing regardless of visibility; rotating coil compass not suitable; radio compass valuable on isolated routes; radio beacon; comparison of three types of direction finders; development of beam transmitters; no known remedy for "night effect"; beacon emergency landings possible; airplane direction finding by radio not automatic. (a-3, b-2, c-1, d-1, e-0, f-Survey)

482. ANONYMOUS, "Direction-Finding at Sea," Times Trade and Eng. Supp., vol. 21, no. 497, p. 436; 14 January 1928. ABSTRACT: Review of work by S. H. Long, entitled Navigational Wireless; purpose of book is to give navigating officer intelligible account of direction-finding instruments that are now at his disposal, and give wireless operator some general information as to way in which bearings are applied in navigation. (a-3, b-2, c-1, d-0, e-0, f-Practical description)

483. ANONYMOUS, "Radio Rotating-Beacon Transmitters," Elec. Rev., vol. 102, no. 2617, pp. 123-124; 20 January 1928. ABSTRACT: Theoretical discussion of possible aerial arrangements; their application to marine navigation and aircraft for direction-finding purposes. Extracts from papers read before Wireless Section of Instn. Elec. Engrs. (a-3, b-1, c-1, d-5, e-0, f-Theory)

484. ANONYMOUS, "Rotating-Beacon Radio Transmitters," Experimental Wireless, vol. 5, no. 53, pp. 85-93; February 1928. ABSTRACT: Abstracts of three papers read at Wireless Section of Instn. Elec. Engrs., as follows: Rotating Loop Radio Transmitters and Their Application to Direction-Finding and Navigation, T. H. Gill and N. F. S. Hecht; Experiments on Application of Rotating-beacon Transmitter to Marine Navigation, R. L. Smith-Rose; Theoretical Discussion of Various Possible Aerial Arrangements for Rotating-Beacon Transmitters, R. L. Smith-Rose. (a-3, b-1, c-1, d-5, e-0, f-Abstracts)

485. GILL, T. H., AND N. F. S. HECHT, "Rotating Loop Radio Transmitters and Their Application to Direction Finding and Navigation," JIEE, vol. 66, pp. 241-255; March 1928. See also Experimental Wireless; 1928. ABSTRACT: The chief object of the method is to eliminate direction-finding equipment and to reduce operational difficulties in aircraft. A characteristic of the radiation is "timed" by a chronograph, the interval between a Morse signal and the characteristic indicating the bearing. A loop aerial is used, and the electromagnetic energy radiated from the loop is a maximum in one direction and a minimum in another. The loop sends out a continuous signal, which is interrupted when the line of minimum radiation is in the true N direction, and a special Morse signal is transmitted at that moment to enable an observer to start a chronograph. In the Discussion, C. E. KENNEDY-PURVIS concluded that the accuracy is of the same order as with existing ship or shore direction-finding systems. S. H. LONG asked if it is practicable to use a vertical aerial transmitter, tuned and coupled to the rotating loop, to work on a heart-shaped rather than a figure-of-eight diagram. (a-3, b-1, c-1, d-5, e-0, f-Description)

486. SMITH-ROSE, R. L., "Theoretical Discussion of Various Possible Aerial Arrangements for Rotating Beacon Transmitters," JIEE, vol. 66, pp. 270-274; Disc., 274-279; March 1928. See also Experimental Wireless, vol. 5, pp. 90-92;Disc., 92-98;February 1928. ABSTRACT: Three arrangements for a rotating beacon transmitter are discussed from the theoretical point of view, these systems being the single coil, the double-spaced coil, and the Adcock aerial arrangement. In searching for a type of rotating beacon transmitter upon which the observed bearings are independent of night errors, the Adcock arrangement appears to be the most hopeful; this system is therefore considered in more detail from the practical standpoint. (a-3, b-1, c-1, d-1, e-0, f-Descriptive theory)

487. SMITH-ROSE, R. L. AND CHAPMAN, S. R., "Some Experiments on the Application of the Rotating Beacon Transmitter to Marine Navigation," JIEE, vol. 66, pp. 256-269; 1928. See also Experimental Wireless, vol. 5, pp. 88-90; February 1928. ABSTRACT NO. 1: The paper describes a series of experiments on a rotating loop beacon transmitter installed at Fort Monckton. In tests carried out on various cross-channel ships the accuracy of the wireless bearings obtained from the beacon were measured at various distances and the range of the beacon for reliable working ascertained. The night errors, encountered at the longer distances, were studied in more detail at various fixed positions, chosen to show the effect of transmission over sea and land respectively. A comparison is made both at sea and on land between the bearings observed on the rotating beacon and those obtainable with an ordinary direction finder. In the Discussion, F. W. DAVEY gave reasons for considering that the rotating beacon is not an economic proposition as an aid to ship's navigation. J. ROBINSON pointed out the importance of testing the night variations of bearings in the air. P. P. ECKERSLEY questioned whether direction-finding stations on the ground are not equally as effective as beacon transmitters. C. H. BOYD raised the question of the power necessary in beacons of this kind. ABSTRACT NO. 2: This paper describes a series of experiments carried out with rotating loop beacon transmitter. The accuracy of the wireless bearings obtained from the beacon was measured at various distances and the reliable working range of the beacon was ascertained. The night errors encountered at long distances were studied in detail at fixed position to measure transmission effects over sea and land. The bearings obtained are compared with those obtainable with a D/F. The relative merits of the two systems are discussed. (a_1-2, a_2-6, b-1, c-1, d-5, e-0, f-Study)

488. SCHWARTZ, M. P., "Application of R. D. F. to Surveying," Comptes Rendus, vol. 186, p. 73; January 1928. ABSTRACT: Communications showing that the azimuths obtained by D/F are as good as the ones obtained by optical systems. (a-6, b-1, c-3, d-3, e-0, f-Description)

489. AICARDI, J., "New Arrangement of Alignment for Hertzian Emissions," Comptes Rendus, vol. 186, pp. 305-307; 30 January 1928. See also Wireless Engineer, vol. 5, p. 288; May 1928. ABSTRACT NO. 1: Two antennas a small distance apart transmit waves of the same frequency but with a well-defined phase difference. One antenna emits cw and the other a modulated signal. It is "explained" why the precision is greater than that of the ordinary interference device, being capable of giving a "result correct to one degree." ABSTRACT NO. 2: This arrangement is intended to enable navigators to follow a set course in times of fog. It consists essentially of two emitting antennae at a slight distance apart and emitting waves of the same length, but presenting a clearly defined phase difference. When these waves are maintained and emitted with the same energy, there exists in space nodal lines along which the field, and consequently the reception, is nil. In this paper the arrangement of such a system is discussed in which one antenna emits pure waves, the other waves modulated to a musical frequency f. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Descriptive analysis)

490. FRANCK, P., "Radio Compass in Aerial Navigation," Onde Elec., vol. 7, pp. 109-118; March 1928. ABSTRACT: The author shows how valuable an aid to aerial navigation would be given by a radio compass. It should be easy to manipulate and simple to install. The errors in space and time which are likely to arise due to errors in the radio compass, or due to cross winds, are calculated and shown to be comparatively negligible on long flights. In conclusion the author pleads that radio engineers should devote their attention to the production of such an instrument. (a-3, b-1, c-3, d-3, e-0, f-Descriptive evaluation)

491. GILL, T. H., AND HECHT, N. F. S., "Direction-Finding in Navigation," Nature, vol. 121, p. 189; February 1928. ABSTRACT NO. 1: A discussion of a paper by T. H. Gill, and N. F. S. Hecht, and

a paper by R. L. Smith-Rose and S. R. Chapman. The Gill and Hecht article dealt with D/F equipment on aircraft. A loop antenna was employed at the station; it rotated at one rpm and sent out a continuous signal. The signal was interrupted when the line of minimum radiation was in the true-north direction. An observer measured the difference between the time the minimum signal was in a true-north direction and the time that he received a minimum signal, and thereby determined a line of bearing. ABSTRACT NO. 2: The Smith-Rose and Chapman article dealt with a rotating loop beacon used for marine navigation. It was concluded that up to 50 miles, the beacon method gives accurate readings. Beyond that point, bearings are subject to night errors and deviation due to land effects. (a-6, b-1, c-1, d-5, e-0, f-Description)

492. MESNY, R., "Discussion and Summary of the Work Done in Electromagnetic Wave Propagation," Onde Elec., vol. 7, pp. 130-15-, February 1928. ABSTRACT: Summary of the work done in wave propagation in 1926, 1927, and 1928. Importance of absorption phenomena; discussion on the formation of the ions and their effects; verification of the electric constants of gases; influence of solar activity and weather. A bibliography of 45 references is given. (a-6, b-1, c-3, d-3, e-0, f-Survey)

493. SHARYRAW, D. C., "Direction-Finding in Navigation," Nature, vol. 121, p. 189; 4 February 1928. ABSTRACT: It is of great importance to aircraft to know exactly the direction in which they are traveling, and hence direction finding equipment has been elaborated. This not only takes up much of the limited space available but is often also difficult to operate. The Air Ministry has recently developed a new method of direction finding in its design establishment at Biggin Hill. This was described on January 4 to the Institution of Electrical Engineers by Messrs. T. H. Gill and N. F. S. Hecht. The chief object of the method is to replace the direction-finding equipment on the aircraft by something very much smaller and easier to operate. A loop aerial is employed at the station, the energy radiated from the loop being a maximum in one direction and a minimum in another. The loop rotates about a vertical axis at a speed of one rpm and sends out a continuous signal. This signal is interrupted when the line of minimum radiation is in the true north direction and a special Morse signal is transmitted at that moment. This enables the observer to start a chronograph. He can then find the interval between the north signal and the instant at which he is receiving minimum radiation. He thus obtains his bearing. From the results obtained it was found that bearings could be determined with an accuracy at least equal to that obtained by any other radio method of direction finding. For the accuracy necessary for aerial navigation, this method gives a range of 200 miles. The Air Ministry having found the 'rotating beacon' method of great use for aircraft, the Radio Research Board has made a series of experiments to find out if it would be equally useful for navigation. The results of these experiments were communicated to the Institution of Electrical Engineers by Messrs. R. L. Smith-Rose and S. R. Chapman at the same meeting. The rotating-loop beacon was installed near Gosport and a calibration was carried out at fixed points in various directions up to a distance of 60 miles. It was found that the observed bearings were subject to a permanent deviation due to land effects. This permanent deviation was not greater than one or two degrees. At distances exceeding 60 miles, radio bearings got by this method were found to be subject to night effects similar to those obtained in radio direction finding. The errors were not serious, however, until the range exceeded 90 miles oversea. Even at great distances a fair accuracy can be obtained by taking the average value of a series of readings made in about ten or fifteen minutes. It was concluded that, up to 50 miles, the rotating beacon method gives accurate readings. Compared with the ordinary direction finder as used on board ship, this method has several advantages. It is independent of the steadiness of the ship, and also of the accuracy with which the ship's head is given by the compass reading at the instant of observation. No correction or compensation corresponding to the quadrantal error associated with the ship's direction finder is necessary. It was proved, however, both theoretically and experimentally, that the limitation of the accuracy by night effects applies to both methods. (a-1, b-1, c-1, d-5, e-0, f-Description)

494. NODON, A., "Wave Propagation, Solar Spots, and Atmospheric Conditions," Onde Elec., vol. 7, pp. 156-161, March 1928. ABSTRACT NO. 1: During the evolution of the diametrically opposed conjugate foci of the sun, very large disturbances occur. Magnetic and electric perturbations, wave propagation perturbations, and variations in atmospheric conditions result. Verification by experimental observations made during the spring of 1927 is included. ABSTRACT NO. 2: Charts illustrating the course of solar disturbances, general and local weather, electric and magnetic variations, and the quality of radio reception in the Pyrenees are given and discussed. It is concluded that the propagation of radio waves is intimately connected with the state of the atmosphere and the electrical and magnetic variations which are themselves related to the solar activity. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

495. SMITH-ROSE, R. L., "Special Dial for Time-Pieces to Be Used with Rotating Wireless or Other Beacons," Journ.-Sci. Instruments, vol. 5, pp. 93-96; March 1928. ABSTRACT: A dial suitable for mounting on a watch whose index-hand rotates once in sixty seconds and for use with a modern rotating beacon making one rpm is described. The outer scale is calibrated in degrees from 0° to 360°, the second scale is marked off in points of the compass, while the innermost scale is maked off in seconds. If the index-hand of the time-piece is started from the 0° or N point when the beacon gives its characteristic N signal, then when the received signal passes through its minimum intensity the position of the index-hand will indicate directly the bearing of the transmitter from the receiver. (a-3, b-1, c-1, d-5, e-0, f-Description)

496. DIECKMANN, M., "Determination of Effective Height of Antennas and of Reception Coefficient of a Radio Set," Zeit. fuer Hochfrequenztechnik, vol. 31, no. 3, pp. 65-72; March 1928. ABSTRACT: Theoretical and experimental study of method based on comparison of intensity of primary magnetic field, caused by received waves, with secondary field in vicinity of antennas, due to Biot-Savart effect. (a-3, b-1, c-4, d-4, e-0, f-Experimental study)

497. ANONYMOUS, "Radio Direction Finder in Navigation,"(German: Telefunken); 12 March 1928. See also Air Document Index No. 2272 F691. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

498. ANONYMOUS, "Radio Control Station Will Guide Planes on Key West-Havana Line," Aviation, vol. 24, no. 10, p. 581; 5 March 1928. ABSTRACT: First of number of radio-control stations to be installed and operated by airways division of Lighthouse Service; for exchange of weather information between terminal airports, radiotelephone communication to airplanes in flight, and radio direction for guidance and navigation of planes; radio beacon of equisignal range type, having two crossed-loop antennas and transmitting interlocked signal. (a-3, b-2, c-1, d-1, e-0, f-Description)

499. ANONYMOUS, "Thirteenth Calibration of the Empire Radio Compass Station, Oregon, on 23 March 1928," USN, Naval Yard, Puget Sound, Washington, Report No. RS3A253A; 30 March 1928. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

500. ANONYMOUS, "London's Terminal Aerodrome," Elect. Rev. Lond., vol. 102, pp. 703-705; April 1928. ABSTRACT: The paper describes the Croydon aerodrome and especially describes the D/F equipment. The D/F system consits of a B-T unit 54 ft high and a suspended phasing antenna 100 ft high. The receiving and D/F equipment consists of a D/F coupled to a Marconi Rg 14 directional receiver for cw and icw on wavelengths between 800-2000 metres. The instrument makes use of cardioid method for D/F. Special feature is arrangement for working more than one D/F and receiver on same antenna by use of a double goniometer, a system of anticoupling, and a dummy antenna. (a-6, b-2, c-1, d-5, e-0, f-Description)

501. FISCHER, F. A., "New Method for the Experimental Determination of the Directional Characteristic of an Antenna," Zeits. f. Hochfrequenztechn., vol. 31, pp. 121-122; April 1928. ABSTRACT: The author's method has the advantage that it is independent of the intensity of the signals. It consists of measuring the deviation of the rays of a distant transmitter, brought about by the reflected field of the antenna in question placed near the direction finder. From the mathematical relations given, the directional characteristic of the antenna can than be obtained. (a-3, b-1, c-4, d-4, e-0, f-Description)

502. LONG, S. H., "New System of Radio Direction-Finding," Teleg. & Teleph. Age, p. 175; April 1928. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-Description)

503. ANONYMOUS, "Directional Radio for Airways," West. Flying, vol. 4, no. 5, p. 50; May 1928. ABSTRACT: Beacon guides for planes added by U. S. Department of Commerce; control stations and beacons will be established on airways where night flying is required; present equipment; control stations planned will broadcast on frequent schedule on 850-950 meters to planes in flight; radio navigation; of greatest importance for power radio reception, that all airplanes be bonded in course of construction; instrument flying. (a-3, b-2, c-1, d-1, e-0, f-Radio navigation)

504. ANONYMOUS, "Radio Direction Finder," Popular Aviation, vol. 2, no. 5, pp. 27 and 92; May 1928. ABSTRACT: Instrument flying of aircraft, by means of visual airway direction finder developed at U. S. Bureau of Standards; visible radio resembled ordinary compass; needle-like reed moved by electric impulses received from radio beacon, and is located on dashboard of plane. (a-3, b-2, c-1, d-1, e-0, f-Radio navigation)

505. FRIIS, H. T., "Oscillographic Observations on the Direction of Propagation and Fading of Short Waves," Proc. IRE, vol. 18, pp. 658-665; May 1928. ABSTRACT: The short-wave transmission is generally but not always located in the vertical plane through the transmission and receiving points. Direction finding depends upon the determination of the direction of the wave at the receiving point; it does not give accurate results when the twilight zone is in the way of the wave path. The angle between the earth and the direction of short-wave propagation varies continuously and the changes in this angle are much larger than the changes in the angle of propagation in the horizontal plane. The observations are consistent with the view that the fading is mainly caused by wave interference. (a-1, b-1, c-1, d-1, e-0, f-Description)

506. KOLSTER, F. A., "Radio Direction Finding Shows Remarkable Growth," Mar. Eng. and Shipg. Age, vol. 33, no. 5, p. 253; May 1928. ABSTRACT: Eighty-one beacon stations in operation over world; mobile radio beacon now being built for use on all vessels; visual indicator developed. (a-3, b-2, c-1, d-0, e-0, f-Summary)

507. PARK, C. A., "Radiobeacons Aid the Navigator," Mar. Rev., vol. 58, no. 5, pp. 44-46; May 1928. ABSTRACT: Twenty radio broadcasting stations now send code signals to ships of Great Lakes; operate on wave length near 1000 m; number of vessels now equipped with radio compass is approximately 300; codes used are various combinations of dots and dashes of Morse telegraph code. (a-3-, b-2, c-1, d-0, e-0, f-Radio navigation)

508. PRATT, H., "Apparent Night Variations with Crossed-Coil Radio Beacons," Proc. IRE, vol.16, pp. 652-657; May 1928. ABSTRACT: The combined effects of apparent wave-direction shifts and fading, of signals from a crossed-coil type of radio beacon as received on airplanes in flight at night, are described. A brief explanation of the operation of such a beacon is given. The results of observations of similar signals at night received on an automobile, together with some general conclusions, are mentioned. (a-1, b-1, c-1, d-1, e-0, f-Description)

509. GUNN, R., "Aircraft Radio and Navigation," Franklin Institute Journal, vol. 205, pp. 849-863; June 1928. ABSTRACT: The essential engineering features of aircraft radio and associated difficulties are discussed. Solutions to these problems are given, although no attempt has been made to describe particular equipment. Two outstanding radio aids to aerial navigation are discussed and a new method described whereby these may be made to operate a visual indicator in such a way that it will not only tell the pilot whether he is off his course but which way he is off. A heterodyne beacon having certain remarkable directional properties is described. (a-1, b-1, c-1, d-1, e-0, f-Description)

510. SMITH-ROSE, R. L., "Directional Wireless Marine Navigation," Nature, vol. 121, p. 745; 12 May 1928. See also Elect. Rev., Lond., vol. 102, pp. 994-995; 8 June 1928. ABSTRACT NO. 1: The author discusses and enumerates the relative merits of directional transmission and reception. Also, the apparent technical superiority of the rotating beacon (rotating loop used as a transmitter) installed on ground over the average direction finder aboard ship is pointed out. ABSTRACT NO. 2: The various systems of marine direction finding are surveyed and their advantages and disadvantages noted. A particular plea is made for the rotating beacon as developed by the Royal Air Force, its great advantage being that it requires no extra equipment on the ship beyond a stop-watch. At the moment it is only accurate to about two degrees, whereas the shore direction-finding receiver claims an accuracy of about one degree. The author suggests that the rotating beacon may also be found to possess economic advantages. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Survey)

511. SMITH-ROSE, R. L., AND CHAPMAN, S. R., "Direction Finding at Sea," Times Trade and Eng. Supp., vol. 22, no. 518, p. 319; 9 June 1928. ABSTRACT: Method of direction finding at sea has been under examination both by Air Ministry and by Committee on Directional Wireless; which involves erection of the rotating beacons at shore stations; results of investigations of such beacon carried out in ships under sea-going conditions. Abstract of Special report no. 6, Dept. Sci. and Indus. Research. (a-3, b-2, c-1, d-5, e-0, f-Study survey)

512. BURGESS, G. K., "Aircraft Radio Beacon Development," Aviation, vol. 24, no. 25, pp. 1764-1765 and 1798-1803; 18 June 1928. ABSTRACT: Aircraft radio-beacon system under intensive development by Bureau of Standards; airplane need only be provided with small receiving set carrying indicator; experimental work done previously; form most recently developed consists of two vibrating steel reeds; receiving set weight less than 15 lb and power supply is 6-volt battery weighing 15 lb; reed indicator also used to transmit messages to pilot when necessary. (a-3, b-2, c-1, d-1, e-0, f-Radio navigation)

513. ANONYMOUS, "The Radio Compass and Aerial Navigation," Industrie Electrique, vol. 37, no. 864, pp. 284-286; 25 June 1928. ABSTRACT: Treats of use of radio compass in aerial navigation; errors of compass are discussed; maximum deviation of airplane from straight line; errors of measurement and errors of drift. (a-3, b-2, c-3, d-3, e-0, f-RDF errors)

514. KEEN, R., "Wireless Direction Finding and Directional Reception," Times Trade and Eng. Supp., vol. 22, no. 521, p. 396; 30 June 1928. ABSTRACT: Review of second enlarged edition of book published by Iliffe. Author claims that at present time the future of wireless direction finding for purposes of navigation seems likely to be divided between systems in which direction finder is carried on ship and those in which bearings are derived from observing rotating beacon by means of ordinary wireless installation. (a-3, b-6, c-1, d-5, e-0, f-Review of 2nd Edition of book)

515. BOUTHILLON, L., "Directed Radiation. Recent Ideas and Results," Soc. Franc. Élect., Bull. 8, pp. 657-679; July 1928. ABSTRACT: The theory of directed radiation for long waves is discussed from the economic aspect, thus leading up to a discussion of short waves and their advantages for long-distance communication. The theory of short-wave beams is then indicated and the various practical systems due to the Marconi Co., Radio Corporation of America, Société Francaise Radio-électrique, Chireix-Mesny, described. The results obtained on traffic between St. Assise and Buenos Ayres are given, the superiority of the new system, employing the S. F. R.-C. M. antenna, being very evident. (a-3, b-1, c-3, d-3, e-0, f-Theory and description)

516. CARSON, J. R., "Reduction of Atmospheric Disturbances," Proc. IRE, pp. 966-975; July 1928. ABSTRACT: The author analyses mathematically an arrangement which provides for high-frequency selection plus low-frequency balancing after detection, and also discusses Armstrong's scheme in which high-frequency selectivity and low-frequency balancing are essential features. The conclusion of the paper is that no appreciable gain is to be expected from balancing arrangements, and that static will always be present. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

517. DELLINGER, J. H., AND PRATT, H., "Radio Aids to Air Navigation," Proc. IRE, vol. 16, pp. 890-920; July 1928. ABSTRACT: An account of the work conducted by the Bureau of Standards in connection with aircraft, leading up to the practical demonstration of a complete set of radio aids for flying on the civil airways of the United States. The main equipment comprises a radio beacon system for all main routes and radio telephony. The aeroplanes carry vertical pole antennae (to minimise night errors), a simple receiving set, and a visual indicator for the purpose of keeping on the course. A beacon transmitter, working on 290 kilocycles, consists of two perpendicular loop antennae radiating on the same wave-length, but with different modulating frequencies, 65 and 85 cycles, for example. These modulating frequencies operate two tuned reeds in the indicator. The reeds are adjusted to vibrate vertically and of equal magnitude when the aeroplane is heading for the beacon, but on any other course the signals received from the two radiating loops are no longer equal and the indicator responds accordingly. It is intended that the beacons should be spaced at distances not greater than 200 miles. In order to indicate distances along the course, small power marking or local beacons are to be provided to indicate position to the pilot. (a-3, b-1, c-1, d-1, e-0, f-Description)

518. FISCHER, F. A., "Disturbing Reflected Fields in the Neighborhood of Direction-Finders," ETZ, vol. 49, pp. 1043-1045; 12 July

1928. See also Wireless Engineer, vol. 5, p. 522; September 1928. ABSTRACT NO. 1: A complete mathematical theory of the action of the reflected field of a frame direction-finder operating with an auxiliary antenna is given, and compensation methods are described and discussed. The method of compensation is to annul the disturbing field by a second reflecting structure, which, in the case of a ship, is a loop lying in the ship's longitudinal plane. The effect of a mast can be counteracted by a vertical wire antenna. ABSTRACT NO. 2: The basis of this paper has appeared in articles dealing with errors on board ship, but the paper reproduces a general survey of many papers, dealing with first, the theory of the reradiated field, and then, with its compensation. The paper deals throughout with a D/F using a loop with associated vertical antenna. (a_1-3, a_2-6, b-1, c-4, d-4, e-0, f-Survey)

519. WINTERS, S. R., "Radio Progress," Popular Aviation, vol. 3, no. 1, pp. 36-38; July 1928. ABSTRACT: Radio direction-finding equipment devised by Bureau of Standards; short vertical rod as antenna; two vibrating reeds indicate to pilot whether he is safely on his course or deviating to right or left visual indicator proper can also be employed to send messages to pilot; 10 ft metal rod, mounted erect in airplane to displace trailing wire; miniature 6-tube receiver weighs only 15 lb; additional 15 lb for 6-volt battery as power plant. (a-3, b-2, c-1, d-1, e-0, f-Survey)

520. SMITH-ROSE, R. L., AND CHAPMAN, S. R., "A Rotating Radio Beacon," Eng., vol. 126, no. 3264, pp. 130-131; 3 August 1928. ABSTRACT: Ordinary open aerial of wireless installation is replaced in beacon by vertical rotating frame aerial consisting essentially of vertical oblong flat coil; coil in beacon rotates at uniform rate round vertical axis and listener at each receiving station therefore gets zero, or minimum, signal twice in each revolution; accuracy of observations made in this way depends essentially on uniformity with which beacon revolves and is synchronized with stopwatch. Abstract of report by Committee on Directional Wireless. (a-3, b-1, c-1, d-5, e-0, f-Description)

521. ANONYMOUS, "Radio-Telegraph Transmission by Directed Waves," Industrie Electrique, vol. 37, nos. 867 and 868, pp. 541-546; pp. 372-376; 10 and 25 August 1928. ABSTRACT: Aug. 10: Treats of radio transmission by means of direction antennas arranged suitably with regard to reflecting antennas; height of antenna network; comparison of bunched with simple vertical antennas. Aug. 25: Graphical construction of polar diagrams of radiating fields from bunched vertical antennas. (a-3, b-2, c-3, d-3, e-0, f-Description)

522. SMITH-ROSE, R. L., "Radio Direction Finder," Wireless World, vol. 23, nos. 7 and 9, pp. 186-188, 247-251; 15 and 29 August 1928. ABSTRACT: Aug. 15: General arrangement and constructional details; frame coil and screen; screened receiver; operating direction-finding; degree of accuracy obtainable. Aug. 29: Cosine law; elimination of antenna effect; advantages of wire screen; unequal capacities to earth. (a-3, b-1, c-1, d-5, e-0, f-Description)

523. SMITH-ROSE, R. L., "The Theory of the Frame Aerial. Avoiding Electrostatic Pick-up," Wireless World, vol. 23, no. 7, pp. 186-188; 15 August 1928. ABSTRACT: Single-frame coil direction finder consists essentially of vertical-loop aerial rotating about vertical-axis and connected to suitable wireless receiver; methods adopted for overcoming effects of spurious emf's are based on use of somewhat elaborate screening arrangements which are described in some detail; advantages of wire screen. (a-3, b-1, c-1, d-5, e-0, f-Theory)

524. SERVICE, J. H., "Radio Acoustic Position Finding in Hydrography," AIEE, vol. 47, pp. 670-674; September 1928. ABSTRACT: In this method of position finding a number of microphones are set up at suitable shore stations whose positions are known, the microphones themselves being actually under water and connected by cable to amplifiers in the shore stations. A radio transmitter is arranged at the shore station and connected so that its operation is controlled by the microphone. A ship wishing to determine its position fires a small bomb underwater alongside the ship, the instant of firing being recorded on a chronograph. The sound of the explosion affects the shore station microphone and causes the radio transmitter to send out a dash followed by a signal characteristic of the particular shore station. This is received on the ship and recorded on the same chronograph as the other signals. By the use of two or more stations the ship is then able to determine accurately its position with reference to them. A simple device for quick plotting of the position is also described. The accuracy obtained is of the order of 0.3 to 0.5 of 1 percent, assuming the physical conditions of the water and hence the velocity of sound in it are fairly well known. (a-3, b-1, c-1, d-1, e-0, f-Theory)

525. SHANGRAW, C. C., "Radio Beacons for Transpacific Flights," Proc. IRE, vol. 16, no. 9, pp. 1203-1235; September 1928. ABSTRACT: Deals with radio beacon and its practical application in connection with long distance flights over water; it describes briefly operation of equi-signal radio-beacon system as developed by Air Corps and Signal Corps Aircraft Radio Laboratories at Dayton, Ohio, during past few years; beacon station installed at Wheeler Field near Honolulu. (a-3, b-1, c-1, d-1, e-0, f-Radio beacons)

526. BURNETT, D., "Directional Properties of Radio Receiving Aerials," Cambridge Phil. Soc., Proc., vol. 24, pp. 521-530; October 1928. ABSTRACT: This paper, which is largely mathematical, extends the previous work of Moullin and Colebrooke (connecting the received signal intensity and the orientation of the antenna, partly vertical and partly horizontal, for a wave front incident vertically) to the case usual., met with in practice of a tilted incident wave front. The same method is applied to obtain an approximate theory of the Beverage antenna. (a-3, b-1, c-1, d-5, e-0, f-Theory)

527. MAURAIN, C., "Solar Activity and Terrestrial Magnetism," Onde Elec., vol. 7, pp. 413-427; October 1928. ABSTRACT: The author first reviews the facts established regarding the frequency and movements of sunspots. An examination of magnetic records obtained near Paris indicates a diurnal variation with larger summer than winter values and a yearly change of the diurnal amplitude with the epochs of maximum and minimum number of sunspots. From a statistical examination large magnetic disturbances occur 2-1/2 days after sunspot changes, but at sunspot minimum the delay is 3-3/4 days. Many large magnetic disturbances cannot be traced to visible sunspot changes. He considers that the magnetic changes are due to the arrival in the upper air from the sun of electrified particles. These will have an associated magnetic field during their movement and they increase the conductivity of the air and so increase the electric currents induced by atmospheric motion in the earth's magnetic field. The author also considers that the speed of the electrified particles may vary with the phase of solar activity. (a-3, b-1, c-3, d-3, e-0, f-Theory)

528. ANONYMOUS, "Theoretical Possibilities of Utilization of Hertzian Rotating Beacons," Industrie Electrique, vol. 37, no. 871, pp. 447-451; 10 October 1928. ABSTRACT: Author studies types of rotating radio beacons; single frame; double frame; system with Adcock-type antenna; general equation of transmission for each type. (a-3, b-2, c-3, d-3, e-0, f-Study report)

529. CRAWLEY, C., "Navigation by Invisible Rays," Television, vol. 1, no. 8, pp. 45-46; October 1928. ABSTRACT: Describes navigation of shipping in fog by developing and perfection of wireless direction finder; infra-red rays, noctovision; short wireless waves; rotating beacons; all-round beacons; direction-finding stations. (a-3, b-2, c-1, d-1, e-0, f-Description)

530. BEST, G. M., "What Is an Underground Antenna?," Radio, vol. 10, no. 11, pp. 21-22, November 1928. ABSTRACT: Investigation of various devices of this type to determine their merits and also to obtain accurate definition of underground antenna as conceived by its inventors; study of patent papers discloses interesting data; nature of various devices being sold, and results obtained with them when used with average broadcast receiver. (a-3, b-2, c-1, d-1, e-0, f-Study)

531. DUCKERT, P., "Direction-Finding Errors and Their Dependence on Weather Conditions," E.N.T., vol. 5, pp. 438-441; November 1928. ABSTRACT: Analysis of weather conditions show that directional errors and momentary fluctuations of direction occur when unstable aerological and meteorological conditions exist between the transmitting and receiving stations. These effects are discussed in some detail. (a-3, b-1, c-4, d-4, e-0, f-Analysis)

532. GRESKY, G., "The Action of Reflectors on Short Electric Waves," Zeit. f. Hochf., vol. 32, pp. 149-162; November 1928. ABSTRACT: An experimental investigation was carried out on the operation of cylindrical-parabolic and of plane reflectors for short waves, and on the dependence of the operational characteristics on the dimensions of the reflectors used. The best value found for the ratio of the focal length (f) of the parabolic reflectors to the wave-length (λ) was $f/\lambda = 0.27$. For plane reflectors the best ratio for f'/λ, where f' is the distance from the transmitting aerial to the reflector, was $f'/\lambda = 0.20$. The dependence of the operational characteristics on the dimensions was qualitatively the same for both plane and parabolic reflectors. Two different types of reflector were investigated: the

tuned type and the untuned type. For the wave-length used (2.78 m) the numerical values for narrowness of beam, rearwards radiation and amplification were a few percent, worse for the tuned reflector ($l < \lambda/2$, $d \sim \lambda/8$) than for the untuned reflector ($l \sim \lambda$, $d \sim \lambda/30$), where l is the length of the reflector wires and d their spacing. For both types the opening should not be made greater than 1.5λ. The advantage of the tuned reflector lies in its more convenient size, that of the untuned in the fact that tuning is not required. In general, a parabolic reflector is used on account of its appreciably greater strengthening power and directive effect than are obtained with a plane reflector. Measurements made at distances of 4 and 18 km confirmed qualitatively the qualitative measurements made in the neighbourhood of the transmitter. (a-3, b-1, c-4, d-4, e-0, f-Description)

533. CRAWLEY, C., "Wireless as an Aid to Navigation," Discovery, vol. 9, no. 107, pp. 351-354; November 1928. ABSTRACT: Short wave beam system has revolutionized whole outlook of wireless communication during last two years; rotating wireless transmitter; outstanding advantage of this type of beacon; different systems of directional reception at present used in ships; all-round beacons are only of use to ships which are fitted with directional receivers. (a-3, b-2, c-1, d-0, e-0, f-Survey)

534. BAILEY, A., DEAN, S. W., AND WINTRINGHAM, W. T., "The Receiving System for Long-Wave Trans-Atlantic Radio Telephony," Proc. IRE, vol. 16, no. 12, P. 1645; December 1928. ABSTRACT: Transmission considerations and practical limitations indicate that in the lower frequency range, frequencies near 60 kc are best suited for transatlantic radio-telephone transmission. A radio receiving location in Maine gives a signal-to-noise ratio improvement over a New York location equivalent to increasing the power of the British transmitter about 50 times. Various types of receiving antennas are briefly discussed. The wave-antenna is selected as being most suitable for long-wave radio telephony. The various factors affecting wave-antenna performance and methods for measuring the physical constants of wave-antennas are discussed in detail. High-frequency ground conductivities determined from wave-antenna measurements are given. Combination of several antennas to form arrays is found to be a desirable means of decreasing interference. The use of a wave-antenna array in Maine decreases the received noise power by an additional 400 times. If the receiving were to be accomplished near New York using a loop antenna, we would have to increase the power of the British transmitting station 20,000 times to obtain the same signal-to-noise ratio. Comparisons of calculated and observed directional diagrams of wave-antennas and wave-antenna arrays are presented and discussed. The transmission considerations governing the design of a radio receiver for commercial telephone reception are outlined. Mathematical discussions of the wave-antenna, antenna arrays, quasitilt angle, and probability of simultaneous occurrence of telegraph interference are given in the appendices. (a-1, b-1, c-1, d-1, e-613, f-See also Abstract Nos. 549 and 560)

535. GUYOT, "Study of Short-Wave Propagation," Onde Elec., vol. 7, pp. 509-530; December 1928. ABSTRACT: The propagation of short waves is first discussed on the supposition that the Heaviside layer has its elements determined uniquely by the position of the sun. The theoretical conclusions derived are then compared with the experimental results of Meany and with observations during aircraft flights in North Africa. A study is then made of the modifications required when account is taken of the velocity of variation of ionisation at a point in the atmosphere, and the conclusions arrived at are again tested by comparison with experimental results for short-wave transmissions. (a-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

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536. ANONYMOUS, "Instructions for Reconditioning Model DO, DO-1, DP, DP-1, DP-2, DP-3, Direction Finder Loops, " U. S. Navy Bureau of Ships. See Department of Commerce PB38635; ca 1929. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

537. ANONYMOUS, "Instructions, Radio Direction Finder Model DG," Wireless Specialty Apparatus Co., Boston, Mass., August 1929. See Department of Commerce PB17435. ABSTRACT NO. 1: The installing of Direction-Finder equipment involves the following prime considerations: (a) assembly and installation in such manner as will insure security in position and continued mechanical performance; (b) choice of location to provide greatest convenience in making observations and minimum exposure to disturbing effects produced by ship's rigging and equipment, (c) provision for minimizing disturbing electrical effects due to ship equipment; (d) calibration of Direction-Finder; and (e) adjustment of the automatic corrector. Instructions are given here which cover the order of assembly, describe those parts not seen from the outside, and call attention to such features as require special consideration. Security in position and continued mechanical operation without inconvenience depends in great part in following these instructions. The location will be in accordance with instructions from the Bureau of Engineering. The limitaions are: (1) mechanical, wherein the location must be such as to permit the loop assembly to be mounted directly over the receiver; and (2) electrical, wherein the center of the loop should be at least six feet from large metal objects, such as masts, funnels stays, etc. ABSTRACT NO. 2: This report contains instructions for the installation, adjustment, and operation of the DG Direction Finder (medium frequency) for shipboard use. The report also contains operating instructions for the radio compass, Model DG. (a_1-1, a_2-3, b-3, c-1, d-1, e-845, f-Instructions)

538. ALINDRET, R., "Frames with Multiple Windings," QST Francais et Radioéletricité Réunis, vol. 10, no. 58, pp. 38-43; January 1929. ABSTRACT: Description of frame antennas and methods of winding, principally that of Berché. (a-3, b-1, c-3, d-3, e-0, f-Description)

539. DELLINGER, J. H., AND DIAMOND, H., "Radio Developments Applied to Aircraft," Mechanical Engineering, vol. 51, p. 509; 1929. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

540. DUCKERT, P., "On the Determination of Bearings of Transmitting Stations by Wireless D/F," Mitt. Aeron. Obs. Lindenburg, pp. 193-197; 1929. ABSTRACT: The author refutes the idea that the size of the triangle of error is a measure of the accuracy of the direction finder. He considers the ordinary procedure (method of smallest quadrate square) to be inapplicable, since the systematic errors due to weather conditions are considerably greater than casual errors. These systematic errors are, he suggests, of such a kind that the bearing rays within the North Sea network are all simultaneously deflected in the same sense and by same amount. On this hypothesis he proposes that for any determination of bearing, the three bearing rays should be swung so as to obtain the smallest possible triangle. (a-6, b-1, c-4, d-4, e-0, f-Theory)

541. HEBECHER, O., "Direction-Finding Night Effect," Hansa Deutsche Schiffahrtszeitschrift, vol. 66, p. 336; 1929. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

542. HEBECHER, O., "The Effects of Polarization of Magnetic Vectors in D/F Reception," Ann. d. Hydrogr., vol. 59, p. 293; 1929. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

543. HEBECHER, O., "Wireless Direction Finding," Ann. d. Hydrogr., vol. 57, p. 89; 1929. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

544. HELL, R., "G. M. I. Radio Direction Finder," Bull. Soc. Franc. Elect., vol. 3, p. 3; 1929. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

545. LA FORGE, L., "Path of Electromagnetic Rays," Q. S. T. Francais, vol. 9, no. 54, 55, 57, 61; 1929. ABSTRACT: Analysis of the work done by the Radio Research Board. Discussion of night errors, wave attenuation, fog effect, etc. (a-6, b-1, c-3, d-3, e-0, f-Analysis)

546. STENZEL, H., "On the Directional Characteristics of Radiators Arranged in a Plane," E. N. T., vol. 6, p. 166; 1929. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

547. WEDEMEYER, E. A., "On the Coastal Refraction of Waves," Ann. d. Hydrogr., vol. 55, p. 301; vo. 57, p. 23; 1929. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

548. ANONYMOUS, "Error-Correction in Direction Finders," Wireless, vol. 6, p. 45; January 1929. ABSTRACT: To correct for errors due to masses of metal, steel masts, etc., the receiving loops are encircled by a guard loop provided with adjustable resistance and inductance. (a-6, b-1, c-1, d-5, e-0, f-Description)

549. BAILEY, A., ET AL., "Discussions on the Receiving System for Long Wave Transatlantic Radio Telegraphy," Proc. IRE, vol. 17, no. 1, pp. 174-184; January 1929. ABSTRACT: An eleven-page discussion including comments by F. P. Guthrie, Austin Bailey, August Hund, A. H. Taylor, Alfred N. Goldsmith, K. S. VanDyke, W. T. Wintringham, Haraden Pratt, and F. H. Murray, on the referenced paper, see nos. 534 and 560. Comments referred to advantages of North Atlantic propagation paths at VLF, theoretical prediction of optimum frequency and/or distance for communications and certain questions concerning measurements on Beverage antennas. Beverage antenna terminations related to surface moisture were mentioned. A. H. Taylor referred to night effect (polarization error) and Bailey stated they could not receive at night because of this. Other variations with frequency and location were discussed. Numerical values of the ground connection and characteristic impedance of the Houlton Maine antennas were mentioned. The characteristic impedance ranged 400 to 450 ohms. Ground resistances were quoted as "poor" - 40 ohms, "good" as 1 to 2 ohms resistance and 1 to 2 ohms positive reactance. A short approximate solution to the problem of summing random phases is given. (a-4, b-1, c-1, d-1, e-613 and 631, f-Discussion)

550. CARSON, J. R., "Ground Return Impedance: Underground Wire with Earth Return," Bell System Techn. J., vol. 8, pp. 94-98; January 1929. ABSTRACT: In certain transmission problems, principally those relating to induction and interference phenomena, it is necessary to know the transmission characteristics of a circuit composed of an underground wire with earth return. These can be evaluated by well-known engineering formulae provided the ground return impedance is known. The present paper gives the mathematical solution of this problem and shows that the ground return impedance is substantially independent of the depth of the wire below the surface. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

551. SMITH-ROSE, R. L., "The Reversibility of Radio Direction-Finding and Local Error at Rotating-Loop Beacons," JIEE, vol. 67, pp. 149-156; January 1929. ABSTRACT NO. 1. Considers the applicability of the reciprocity theorem to the practice of radio D/F with either a rotating loop transmitter or a loop receiver. Three methods are suggested for the case of errors due to wires in ground: put another wire in the ground at right angles to the first; put another wire over the D/F coil at the same distance from it as the disturbing wire and in the same direction; or a plane vertical-closed loop is set up parallel to the wire and surrounding the D/F coil. From other experiments, it is shown that the occurrence of night errors is experienced on both systems of D/F to approximately the same extent. ABSTRACT NO. 2: In this paper the use of the reciprocal theorem in the practice of radio direction finding with either a rotating loop transmitter or a loop receiver is considered. An account is given of some experiments carried out with a view to demonstrating that local site errors are similar for a rotating loop transmitter and a rotating loop receiver. This similarity was of service in locating the cause of a permanent error in the Fort Monckton rotating beacon. Other experiments show that night errors are experienced on both systems of direction finding to about the same extent. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Experimental study)

552. DAVIS, A. H., "Water Ripples and Wireless Waves," Wireless World and Radio Review, vol. 24, pp. 56-59; 16 January 1929. ABSTRACT: The various experiments which may be performed with a ripple tank to illustrate effects observed with the transmission of wireless waves are described and the problems of coastal refraction, reflection, night effect, and their relation to direction finding illustrated by appropriate photographs. (a-3, b-1, c-1, d-5, e-0, f-Description)

553. ANONYMOUS, "Description of a Complete Visual Apparatus for D/F," Onde Elec., vol. 8, p. 143; February 1929. ABSTRACT: Summary of the recommendations of the Bureau of Standards (Washington, D. C.) for radio direction finding (no. 6, 1928): description of a visual apparatus using tuned-reed indicators. (a-6, b-1, c-3, d-3, e-0, f-Description)

554. DRAKE, F. H., "Aircraft Radio Receiver for Use with Rigid Antenna," Proc. IRE, vol. 17, pp. 306-319; February 1929. ABSTRACT: An outline is given of the physical and electrical requirements of an aircraft radio receiver suitable for the reception on a rigid antenna of radio beacons and weather service. The design of a special unicontrol receiver calculated to fulfil these requirements is described. Quantitative performance data are presented, with particular attention to the problem of detector overloading when operating a visual indicator from a beacon of the Bureau of Standards' type. The corroboration of these data by practical tests is briefly discussed. The paper is concluded with a quantitative discussion of the problem of ignition shielding on a particular type of aeroplane motor. (a-1, b-1, c-1, d-1, e-0, f-Description)

555. SCHELLER, O., "Radio Beacons," ETZ, vol. 50, pp. 191-192; 7 February 1929. ABSTRACT: An interesting radio-beacon service developed for commerical air routes by the Bureau of Standards. The transmitter consists of crossed directional antennae which are keyed so that the marking signals in the one are the spacing signals in the other. A receiver at a distance along an axis of symmetry will receive equal signals from the antennae, and the combined signal will be a continuous note. In any other direction the signal from one of the antennae will predominate and indicate a divergence of bearing to the pilot. Alternatively, the antennae send tones of 65 and 85 ~ respectively. The received current operates reeds tuned to these frequencies. When on the correct course the responses of the reeds are equal, whereas a divergence from the course is indicated by inequality. (a-3, b-1, c-4, d-4, e-0, f-Description)

556. GLOECKNER, M. H., "Direction Finding Receiver for Use in Aircraft," Zeit. f. Hochf., vol. 33, pp. 92-101; March 1929, pp. 132-136; April 1929. ABSTRACT NO. 1: The Telefunken D/F receiver type 173 N is fully described. The method of sense-finding is discussed, with special reference to the antenna effect of the loop. Corrections to be applied and a method of determining them are discussed. The results of flight-tests of the equipment are given. ABSTRACT NO. 2: A full description is given of the new Telefunken direction-finding receiver for aircraft. The requirements are enumerated, and the way in which these are met in the new receiver, Type 173 N, is compared with data for the earlier model, Type 47 N. The general lay-out of the set is given, and the method employed for sense-finding is discussed at some length with special reference to the antenna effect of the frame aerial. An auxiliary aerial is employed for sense-finding. Photographs illustrate the installation of the set in an aeroplane. The corrections to be applied for effects due to metal parts, etc., of the aeroplane are also discussed. The corrections are determined while the aircraft is on the ground, the aircraft being rotated on a wooden turntable. For this purpose transmissions from a ground station about 20 km away are employed. The second part of the paper gives an account of results obtained in trials on a number of routes. The flights were carried out in several ways; the aircraft being navigated (a) directly towards a distant transmitter, with no allowance for drift; (b) towards one transmitter, and away from a second; and (c) by compass, the drift being ascertained by means of the receiver. The results obtained by the three methods are compared with the aid of diagrams. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

557. KAHN, L., "New Aerial Charts for Wireless Navigation," Onde Elec., vol. 8, pp. 87-102; March 1929. ABSTRACT: The author, after mentioning the various special charts that have been proposed, with comments as to their usefulness, describes his own scheme in which a special chart is required for each route. The chart is derived from a band of the earth's surface whose centre line is the great circle between the two terminal points of the route. The band is opened out flat and the chart deformed as in a planisphere map, thus the great circle is neither stretched nor twisted, and the angles are preserved. In addition to the use of these charts for navigation by radio direction-finding, the author also shows that they simplify the taking of star positions in ordinary navigation. (a-3, b-1, c-3, d-3, e-0, f-Description. Note: Univ. of Illinois dates publication February 1929)

558. MESNY, R., "Solar Activity and Wave Propagation," Onde Elec., vol. 8, pp. 103-110; March 1929. ABSTRACT: The author discusses the work on this subject previously carried out by a number of workers more especialy Anderson, Austin, Espencheid, Maurain, and Pickard. He states in conclusion that there appears to be undoubtedly some connection between solar activity and propagation phenomena, but that the exact character of the correlation is obscure. (a-3, b-1, c-3, d-3, e-0, f-Experimental study. Note: Univ. of Illinois dates publication February 1929)

559. SMITH-ROSE, R. L., Ballantine, S., Taylor, A. H. et al. "Radio Direction-Finding by Transmission and Reception," Proc. IRE, vol. 17, pp. 425-478, 1440-1453, 1897-1898; March 1929. ABSTRACT: This paper presents a critical résumé of the performance of apparatus employed for radio direction determination either by transmission or by reception. After an historical summary of results obtained in various parts of the world, a brief description is given of the fundamental principles underlying radio direction-finding. In this section attention is drawn to the application of the principle of reversibility to this art, by the aid of which the behavior of directive radio transmitters can be largely predicted from the more numerous results

and greater experience already obtained with directional receivers. The next two sections of the paper give a review of the results obtained in Great Britain during the course of extensive investigations into this subject during the past seven years. Observations obtained from thirteen direction-finding receiving stations, specially erected for the purpose, have been carefully analysed and the performance of the apparatus studied under a variety of conditions, including operation in daylight and darkness, and both oversea and overland. In addition, some two years have been spent in studying the performance of a rotating-loop beacon transmitter, by means of which accurate radio bearing can be obtained with any type of receiving apparatus. The later portions of the paper deal with the application of direction-finding to marine navigation, and of the possible effect of coastal and night errors in connection therewith. The production of night errors on closed loop receivers by the horizontal component of the electric force in down-coming waves is explained, and a demonstration is given of the manner in which the Adcock aerial system gives freedom from such errors. The paper concludes with a discussion of the relative advantages of direction-finding by transmission and reception for navigation purposes. A bibliography of the subject is appended. (a-1, b-1, c-1, d-1, e-0, f-Description)

560. BAILEY, A., DEAN, S. W., AND WINTRINGHAM, W. T., "The Receiving System for Long-Wave Transatlantic Radio Telephony," Bell System Technical Journal, vol. 3, no. 2, pp. 309-367; April 1929. ABSTRACT: Transmission considerations and practical limitations indicate that in the lower frequency range, frequencies near 60 kc are best suited for transatlantic radio-telephone transmission. A radio receiving location in Maine gives a signal-to-noise ratio improvement over a New York location equivalent to increasing the power of the British transmitter about 50 times. Various types of receiving antennas are briefly discussed. The wave-antenna is selected as being most suitable for long-wave radio telephony. The various factors affecting wave-antenna performance and methods for measuring the physical constants of wave-antennas are discussed in detail. High-frequency ground conductivities determined from wave-antenna measurements are given. Combination of several antennas to form arrays is found to be a desirable means of decreasing interference. The use of a wave-antenna array in Maine decreases the received noise power by an additional 400 times. If the receiving were to be accomplished near New York using a loop antenna, we would have to increase the power of the British transmitting station 20,000 times to obtain the same signal-to-noise ratio. Comparisons of calculated and observed directional diagrams of wave-antennas and wave-antenna arrays are presented and discussed. The transmission considerations governing the design of a radio receiver for commercial telephone reception are outlined. Mathematical discussions of the wave-antenna, antenna arrays, quasi-tilt angle, and probability of simultaneous occurrence of telegraph interference are given in the appendices. (a-1, b-1, c-1, d-1, e-1, f-See discussion Proc. IRE, January 1929. Paper originally published Proc. IRE; December 1928. See Abstract Nos. 534 and 549)

561. ECKERSLEY, T. L., "An Investigation of Short Radio Waves," Electrician, vol. 102, p. 468; April 1929. See also Experimental Wireless; May 1921, and JIEE, vol. 67, p. 992; 1929. ABSTRACT NO. 1: Discussion of dispersion, multiple scattering, skip fading, and similar phenomena observed in the propagation of short waves. Summary of paper read before the Institute of Elect. Eng. (London) in April 1929. ABSTRACT NO. 2: An account is given of investigations of short-wave transmission effects made during the past two years. These include, firstly, an investigation of scattering, multiple signals and signal mutilation; secondly, the results of a nine months' direction finding interception of short-wave commercial stations; and finally, a discussion, in the light of these results, of the problems of short-wave transmission and such cognate subjects as the nature and constitution of the Heaviside layer, fading, and polarisation effects. The chief alteration in the author's previous conclusions is in the estimated height of the lowest levels of the Heaviside layer in daytime. The accumulation of evidence from time-lag experiments has led the author to a revision of the mathematical result by which he obtained from long-wave measurements the effective height of the daylight ionised layer, and in so doing he has found an error which makes the estimated height just double that previously obtained, making the estimated height lie between 80 km in summer and 97-100 km in winter. With regard to scattering, the glancing angle for transmission, great-circle bearings for the main rays, and the daylight attenuation, the author has found the previous conclusions on the whole to be well founded. Some modification of the lower wave-length limit for night transmission is required, and the author finds that this depends upon the time of the night and season. Late-night regions behave very differently from early-night regions, thus confirming Appleton's results showing a progressive change in the Heaviside layer during the hours of darkness. The short-wave daylight limit appears to be close to 10 metres, but sporadic long-distance transmissions have been observed on wave-lengths shorter than this. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Analysis)

562. HELL, R., "Direct-Reading Wireless Direction-Finding Method," Zeit. f. Hochf., vol. 33, pp. 138-145; April 1929. See also Wireless Engineer, vol. 6, p. 393; July 1929. ABSTRACT: A rotating commutator alternately connects one of two crossed loops to a detector, the output of which is reversed synchronously before being passed to an indicator. The indicator gives a zero reading when the voltages in the two loops are equal. A deflection of the indicator therefore represents a deviation from the direct course to the transmitter. Details are given of the theory, laboratory research, and test flights made in order to develop the method. (a-6, b-1, c-3, d-4, e-0, f-Description)

563. ANONYMOUS, "Ultra-Sonorous Beacon of Calais," Vie Technique et Industrielle, vol. 11, no. 116, pp. 475-477; May 1929. ABSTRACT: Combination of piezo-electric and radio principles are combined for design of direction finder in navigation by means of ultra-sound waves; it is considered best existing system for indicating port entrances. (a-3, b-1, c-3, d-3, e-0, f-Description)

564. ANONYMOUS, "A New Radio Direction Finder," Elect. Rev. Lond., vol. 104, p. 990; May 1929. ABSTRACT: Describes the Marconi DFM.4 D/F operating on the Marconi-Bellini-Tosi system. (a-6, b-1, c-1, d-5, e-0, f-Description)

565. BASHENOFF, V. I., "The Establishment of a General Formula for the Inductance of Single-Turn Circuits of Any Shape," Experimental Wireless, vol. 6, no. 68, pp. 245-251; May 1929. ABSTRACT: Brief description of author's work in investigating design and use of closed aerials, i. e., on calculation of inductance of single-turn circuits of any shape, including curved ones; general formula is derived which shows that all well-known formulas are special cases of law; tests of accuracy of general formula made by practical measurements. (a-3, b-1, c-1, d-5, e-0, f-Description)

566. BURSTYN, W., "Direct Determination of Distance by Electric Waves," Zeits. f. Hochf., vol. 33, pp. 181-183; May 1929. ABSTRACT: The author deduces from equations applying to the radiation from an antenna over a perfectly conducting earth that within a distance of about one-fifth wave-length the electric and magnetic fields increase at a rate greater than hyperbolic, and that the rate of increase of the electric is relatively greater than the rate of increase of the magnetic field. The three rates practically coincide at distances greater than about two wave-lengths. On this basis several ingenious schemes are suggested for determing distances by direct observation. Such schemes, it is pointed out, would be of great value for navigation in fogs. (a-3, b-1, c-4, d-4, e-0, f-Theory)

567. PRATT, H., "Field Intensity Characteristics of Double-Modulation Type of Directive Radio Beacon," Proc. IRE, vol. 17, pp. 873-878; May 1929. ABSTRACT: A statement of the mathematical theory relating to the crossed-frame double-modulation type of radio-beacon transmitter developed by the Bureau of Standards for aircraft work. (a-3, b-1, c-1, d-1, e-0, f-Theory)

568. SMITH-ROSE, R. L., AND HATCHER, E. L., "A New Radio Direction Finder," Elec. Rev., vol 104, p. 990; May 1929. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

569. ANONYMOUS, "Compulsory D/F on Ships," Wireless World, vol. 24, p. 454; August 1929. ABSTRACT: 18 nations signed new convention for safety of life at sea; clause making compulsory the fitting of D/F apparatus on ships. (a-6, b-1, c-1, d-5, e-0, f-Comment)

570. AICARDI, J., "Use of Hertzian Waves for Piloting Ships and Aeroplanes," Annales des PTT, vol. 18, pp. 489-503; June 1929. See also Onde Elect., vol. 8, p. 20; 1929. ABSTRACT: Describes a system in which the axial nodal line of an interference field set up by two short-wave transmitters separated by a distance rather less than one wave-length is used to define the direction of a channel or route. To secure greater sensitiveness, one of the waves is modulated with an audio frequency, and to enable the observer to approach the axial line the phase difference between the waves is periodically varied. This results in a rhythmic variation of the intensity of the note heard, the variations becoming isochronous as the nodal line is approached. By introducing yet another periodic change, it is possible to indicate to the observer on which side of the axis he is situated. Details of the

apparatus used and an account of practical trials are given. (a-3, b-1, c-3, d-3, e-0, f-Description)

571. SMITH-ROSE, R. L., AND HATCHER, E. L., "A New Direction Finder for Naval Vessels," J. Sci. Instrum., vol. 6, pp. 201-208; June 1929. ABSTRACT: The Marconi type DFM. 4 D/F for use on all classes of naval ships is described. The apparatus comprises three units, a loop antenna consisting of two fixed loops totally enclosed in strong metal tubes, a goniometer, and a tuner and amplifier. The equipment covers the range from 300 to 4000 meters. (a-6, b-1, c-1, d-5, e-0, f-Description)

572. SMITH-ROSE, R. L., AND HATCHER, E. L., "Portable Direction Finder," Wireless World and Radio Review, vol. 24, pp. 614-616; 12 June 1929. ABSTRACT NO. 1: The instrument makes use of a supersonic, heterodyne, seven-tube receiver and has a working wavelength range of from 40 to 3000 meters. To cover this range of wavelengths, two separate loop antennas are employed. The article discusses in detail the shielding of the loop and receiver. A circuit diagram is given. ABSTRACT NO. 2: A supersonic heterodyne receiver, tuning over wavelengths of from 40 to 3000 meters, used in conjunction with a single frame-coil already described. Details of components, etc., are given. Readings can be made to 0.5°, although the D/F bearings are not usually reliable to this accuracy. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

573. DIAMOND, H., AND DUNMORE, F. W., "Course-Shift Indicator for the Double-Modulation Type of Radio Beacon," Bureau of Standards, J. of Research, vol. 3, pp. 1-10; July 1929. ABSTRACT: One type of radio beacon consists of loop aerials at right angles to each other carrying current modulated at 65 and 85 cycles respectively. The pilot must then so adjust his course as to keep the intensity at each modulation constant. This paper describes an instrument designed to indicate the course directly on a dial, and also to indicate (in degrees) then course error. This is achieved by means of a rather complex system of loop aerials and filter circuits. The instrument is also of use to indicate to station operators that the course indicated by the beacon is constant. Variations of 0.1 degree can be detected. (a-3, b-1, c-1, d-1, e-0, f-Description)

574. DUCKERT, P., "Errors in Direction-Finding by Wireless," Zeit. f. Hochf., vol. 34, pp. 60-65; August 1929. See also Wireless Engineer, vol. 6, p. 636; November 1929. ABSTRACT NO. 1: A comprehensive survey of the research done by various workers on the several sources of error, but chiefly concerning the results of the writer in correlating certain types of error with atmospheric discontinuities. Results of a 1-1/2 years' study then in progress of automatic direction-finding of atmospherics are discussed. ABSTRACT NO. 2: Possible explanations of the errors in wireless direction finding are given, and these are discussed with reference to the results obtained in a long series of observations. Certain types of weather conditions are shown to have particularly marked effects in giving rise to directional errors. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Survey)

575. HEBBECHER, O., "Direct-reading Direction Finder," Experimental Wireless, vol. 6, p. 454; August 1929. ABSTRACT: Waves received on a directional antenna are rectified and used as the exciting current of a small dynamo, whose output voltage is indicated by a suitable instrument and serves as a measure of the direction of arrival of received waves. (a-6, b-1, c-1, d-5, e-0, f-Description)

576. PUTMAN, G. R., "Rotating Beacon Compared with Ship Direction Finder from Navigational and Economic Viewpoints," Proc. IRE, vol. 17, no. 8, pp. 425-478; 1929. See also Proc. IRE, vol. 17, no. 8, pp. 1449-1452; August 1929. ABSTRACT: This paper gives a summary of the interesting investigations carried on in England, during recent years, by Dr. Smith-Rose, and of other available information, in the field of radio direction-finding. The subject is of especial interest in the United States, where there has been the most extensive development of a radio beacon system: the Lighthouse Service now has in commission 61 of these signals with 14 under construction. Since the first successful signals were established in 1921 near New York, this method of navigation has come into wide use; with the radio compass (or radio direction-finder) on shipboard, it successfully meets a most urgent need of the navigator, giving him the means of taking accurate bearings on invisible signals at great distances. There was never doubt of its universal use in marine navigation, soon as some practical difficulties were removed, and its possibilities became known. (a-1, b-1, c-1, d-1, e-0, f-Discussion)

577. SCHELLENG, J. C., "Reciprocity Theorem, The Earth's Magnetic Field, and Night Effect Errors," Proc. IRE, vol 17, pp. 1452-1453; August 1929. ABSTRACT NO. 1: A very short discussion of the above subjects, bearing on a paper by R. L. Smith-Rose (see ABSTRACT NO. 551). ABSTRACT NO. 2: In the paper the author mentions that reservations are necessary in the application of the reciprocal theorem to actual radio transmission. In his generalization of the reciprocal theorem, Carson pointed out that it appears necessary that the currents in the system be linear functions of the potential gradients involved. These conditions are not strictly satisfied in the case of transmission through media such as the ionized upper atmosphere for two reasons. (1) Motion of the ions across the magnetic field of the wave itself produces a small additional motion in the direction of propagation. This motion is such a function of the wave amplitude that it can be neglected for the small amplitudes used in practice. With this reservation the reciprocal theorem is probably valid in such cases. (2) A real failure of reciprocity occurs when a constant magnetic field, such as that of the earth, is considered. The lack of reciprocity in this case has been recognized by several writers. A simple example is the following. An ionized medium containing the points A and B has a magnetic field in the direction AB. Perpendicular to this line at A and B are two linear antennas, A is vertical but B is rotated 45 deg from the vertical. The distance AB is chosen so that when A is energized, the plane of polarization of the resulting wave, in passing from A to B also rotates 45 deg resulting in a maximum signal in B. In this case the wave has been travelling in the direction of the magnetic field. When, however, B is the transmitter and A the receiver, the plane of polarization, instead of rotating back to a position parallel to A, rotates an additional 45 deg in the same direction as before and at A is perpendicular to the antenna. The current in A is therefore zero. The reciprocal relation therefore fails. For the phenomena to have been reversible would have required a reversal of the magnetic field at the same time as the change in direction of propagation. While proof is lacking, it seems not unlikely that this relation holds in more general cases than the special one given; that is, that in general reversibility is obtained in transmission through such media providing that all externally applied magnetic fields are reversed with the direction of propagation. That such considerations have a great deal to do with directional errors is, of course, well appreciated by Mr. Smith-Rose. It may be of interest to consider the question in some detail. Neglecting errors due to departure from the great circle path, though such departures certainly exist, at any rate for short waves, deviations in apparent bearing are due to the existence of a horizontal component in the downcoming electric field, which in turn is due to the earth's magnetic field. If the direction of this magnetic field could be reversed, the direction of the disturbing electric component would be reversed and with it the sign of the directional error. It would appear at least for a horizontal magnetic field, that regardless of the disposition of the apparatus the errors are the same as long as the directions of propagation are the same. It should be repeated, however, that this assumes uniform conditions along the path. The statement also requires some modification if the path is not short compared to the radius of the earth. If, as seems likely, the present assumptions are correct in general, and if readings in the two directions could be taken closely enough together, equal errors of opposite sign would be obtained merely by reversing the direction of propagation through the same terminal apparatus. An average of the apparent directions in the two cases would therefore be free of error produced by rotation of the plane of polarization. When the directional errors fluctuate and are positive as often as negative, either the difference in the lengths of the paths of the overhead and the ground wave must vary at random between limits of a wavelength or more, or else the plane of polarization of the overhead wave must vary in general through a range of at least one revolution. Figure 14 of the paper would appear to represent such conditions. Incidentally this experiment did not afford a test of the instantaneous reversibility of the system, since conditions were fluctuating too rapidly during the ten-minute intervals which were used. It appears from the above considerations that the system is not reversible. Reversibility of the average bearings seems to have been obtained in this experiment and may indeed represent the usual conditions. A state of affairs can be imagined, however, in which the atmospheric wave would be so steady that a more or less constant nonreciprocal atmospheric error would be introduced. Incidentally this term "atmospheric error" may in some ways be preferable to "night error." It is non-committal as to the exact mechanism (rotation or actual deviation from the path), except that it is due to a wave returned by the upper atmosphere. It can be used without explanation when such effects occur in the daytime, as they do for short waves. (a_1-3, a_2-1, b-1, c-1, d-1, e-0, f-Discussion, see Abstract No. 551)

578. ARDENNE, M., "Improving the Frame Aerial," Wireless World, vol. 25, pp. 252-253; September 1929. ABSTRACT: A discussion of the use of shielded loops to eliminate interference by setting a "null-bearing" on the interference, i.e., antijamming. (a-6, b-2, c-1, d-5, e-0, f-Technique description)

579. STCHOUKIN, M. A., "Observation of Short-Wave Propagation during the Solar Eclipse of November 12, 1928," Onde Elec., vol. 8, p. 411; September 1929. ABSTRACT: Description of the apparatus used at Leningrad to observe the effect of the eclipse on short-wave propagation. Graphs are given. (a-6, b-1, c-3, d-3, e-0, f-Description)

580. TAYLOR, A. H., AND YOUNG, L. C., "Studies of Echo Signals," Proc. IRE, vol 17, pp. 1491-1507; September 1929. ABSTRACT: This paper is a continuation of earlier work, and consists of a more extended study of echo signals with particular reference to directional characteristics and to diurnal variations, attention being given to the question of the relations between the echo signal and the frequency. Distortions, probably due to echo signals, are recorded over long distance transmission, and the relation between the echo signal and the effective height of the Kennelly-Heaviside layer is discussed. (a-1, b-1, c-1, d-1, e-0, f-Experimental study)

581. DUNMORE, F. W., "An Aircraft Direction Finder, Marconi Type A.D. 16," Marconi Rev., no. 15, p. 10; October 1929. Abstract not available. (a-4, b-1, c-1, d-5, e-0, f-0)

582. LOTH, W., "Electromagnetic Guiding of Aircraft: Safe Landing at Aerodromes," Comptes Rendus, vol. 189, pp. 572-573; 14 October 1929. ABSTRACT: An improvement in the leader cable system for aerial navigation is described, together with it application to ensure safe landing at aerodromes under conditions of bad visibility. The leader cable is traversed by a high-frequency (about 10,000 cycles) alternating current, which can be received on an aerial or a frame, so that it is possible, with the frame horizontal, for an aviator to know on which side of the cable he is flying. If, however, the cable oscillates as an aerial, there is no return current, and its field is circular. Knowing his height an aviator can then determine his distance from the cable. In this method the observer must determine the aerial-frame combination giving the weakest signal in order to know whether he is on the one or the other side of the cable. The receiving operation is simplified by using two parallel cables coupled together, when, with a suitable commutation process on the transmitter, the aviator receives, without changing his apparatus characteristic signals according to the lateral position of the machine relative to the cable. If an aerodrome is surrounded by an elevated transmitting line suitable signals can be sent out continually so that an aviator within a radius of 30 km can know the direction of the centre of the aerodrome (by receiving on a vertical frame in the fore and aft position), and later using a second horizontal frame can ascertain when he is over the landing field, and his distance from the ground when about to land. Thus the aviator will hear dashes as he approaches the aerodrome, a continuous note as he passes over the boundary line, dots when he is above the aerodrome, and again a continuous note as he passes through the horizontal plane of the boundary cable. Between this and the ground he again hears dashes. By division of the aerodrome into landing and embarking sectors, the relative positions of which are shown on the aviator's compass card, the danger of collisions in conditions of poor visibility is avoided. (a-3, b-1, c-3, d-3, e-0, f-Descriptive analysis)

583. LOTH, W., "The Guiding of Ships or Aircraft by Directed Waves," Comptes Rendus, vol. 189, pp. 682-684; October 1929. See also Wireless Engineer, vol. 7, p. 104; February 1930. ABSTRACT: To obtain his position, a navigator needs the readings from two or more beacons. The writer proposes to coordinate the rotation of two beacons in such a way that the beams intersect along the route to be followed. Thus, when following the correct route, the navigator will receive the two beams simultaneously, while his position on either side of the route would be indicated by his receiving one beacon before the other. The law of rotation of the beacons can be so arranged that the distance from the route is proportional to the time interval between the two receptions. The application of this general idea to light and radio is discussed. (a-6, b-1, c-3, d-3, e-0, f-Descriptive analysis)

584. WISE, W. H., "Asymptotic Dipole Radiation Formulas," The Bell System Tech. Jour., vol. 8, no. 4; October 1929. ABSTRACT: The analysis of the radiation from dipoles are given by Sommerfield and by Von Hoerschelmann is deficient in one respect: it does not give the true asymptotic expression for the radiation leaving at a considerable angle from the horizontal. The correct asymptotic formulas have already been easily supplied by an appeal to the reciprocal theorem; lately M.J.O. Strutt has got them directly from the boundary conditions and H. Weyl has derived the correct asymptotic formula for a vertical dipole at the surface of the earth by a method quite different from Sommerfeld's. In the present paper it is shown how they can be got by merely improving the rigor of Sommerfeld's analysis. The present analysis begins with the formulas of Von Hoerschelmann for the wave potential of vertical and horizontal dipoles at a finite distance above the surface of the ground and generally follows Sommerfeld. The derivation of an asymptotic approximation for the wave potential of a vertical dipole is considerably different from Sommerfeld's results in the simpler and more precise formulas deduced from the reciprocal theorem. Typographical errors in this paper are corrected by K. A. Norton's "Polarization of Downcoming Ionospheric Radio Waves," NBS Report for NDRC, ca. 1942; See Abstract No. 1275.(a-1 and 4, b-1, c-1, d-1, e-0, f-Analysis)

585. RATCLIFFE, J. A., AND SHAW, W. F. B., "A Determination of Dielectric Constants of the Ground," Nature, vol. 124, p. 617; 19 October 1929. ABSTRACT: Measurements have been carried out on a short wave-length (30 m) up to a distance of 1400 m, and the resulting attenuation curve, in which Hd is plotted as a function of d (where H is the amplitude of the oscillatory magnetic intensity, and d is the distance of the point from the source), shows a maximum when d is about 600 m. The curve is in agreement with Sommerfeld's theory, when a dielectric constant $k = 20$ esu and a conductivity $\sigma = 2 \times 10^{-14}$ emu are assumed for the earth constants. The value for σ is in agreement with the values previously found by using longer wave-lengths. The maximum on the curve is the characteristic feature which enables a reasonably accurate estimate of k to be made. No such characteristic feature is present when longer waves are used. (a-3, b-1, c-1, d-5, e-0, f-Experimental analysis)

586. BOURGONNIER, C., AND LOTH, W., "Guiding by Directed Rays or Radio Beacons - Loth Method," Onde Elec., vol. 8, pp. 469-484; November - December 1929. ABSTRACT NO. 1: Theory of navigation by means of two rotating beams: mathematical analysis of angular speed of rotating beams in the case where the route is a straight line: a practicable system. ABSTRACT NO. 2: In this system there are two rotating emitters of directed waves or beams situated a short distance apart. They may be emitters of visual waves such as searchlights, or they may be infra-red or radio-frequency. If in the case of the two searchlights they both start simultaneously from, say, a north position and rotate with equal speed in opposite directions, then the beams will always intersect on the right bisector of the line joining the two searchlights. The same will apply in the case of radio waves so that on the right bisector of the line joining the two emitters the signals from them will be heard simultaneously. By varying the rates of rotation in a prearranged manner, the line defined by the condition of the simultaneity of reception of the signals may be made to take almost any desired form. by this means the system may be used to define any prescribed routes. In the radio case, instead of using an actual rotating beam transmitter, an ordinary rotating frame is used working on a wave-length of about 200 m. The polar diagram of this is not sufficiently sharp for the purpose, but this is overcome by the use of the Marrec receiver, which, in addition to being especially selective, has a limiting action which in effect very much sharpens the polar diagram. The system has been satisfactorily worked over short distances on a small scale with wireless waves and over normal distances on a full scale with light rays. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

587. DIAMOND, H., "Applying the Visual Double-Modulation Type Radio Range to Airways," Proc. IRE, vol. 17, pp. 2158-2184; December 1929. ABSTRACT: This paper deals with methods for aligning the courses of the visual radio range with the fixed airways. In the aural system the goniometer primaries are excited alternately. This permits independent consideration of the field patters due to the primaries. In the visual system this is not the case, as both goniometer primaries are excited all the time. Two cases present themselves, the condition when the currents in the primaries are in time phase, and the condition when they are in quadrature time phase. The former results in two beacon courses which are 180° apart, and cannot be shifted from this relationship. The latter condition yields four beacon courses. A mathematical analysis is made of this case. (a-3, b-1, c-1, d-1, e-0, f-Description)

588. DRAKE, F. H., AND WILMOTTE, R. M., "On the Daylight Transmission Characteristics of Horizontally and Vertically Polarised Waves from Airplanes," Proc. IRE, vol. 17, pp. 2242-2258; December 1929. ABSTRACT: Using a frequency of about 6 megacycles/sec a comparison was made of the transmissions from (a) a doublet aerial, each arm stretching from wing tip to tail of an aeroplane, and (b) a rigid aerial 6 ft high carried above the fuselage. It was found that the sky ray began to be appreciable with the horizontally polarised wave at a distance of 20 miles, while with the vertically polarised wave it became important at 50 miles. The signal from the sky ray for distances of the order of 150 miles was always stronger with horizontal

polarisation than with vertical. The result with the direct ray was different. The signal from the vertically polarised wave was stronger than that from the horizontally polarised wave over highly conducting ground, while the reverse was the case over badly conducting ground. For this reason the signal from the vertically polarised wave sometimes became very weak at a distance of 40 to 50 miles, before the sky ray was able to arrive with sufficient strength. This occurred particularly on badly conducting ground and when the aeroplane was flying low. From the horizontally polarised wave strong signals were received in all conditions continuously for distances up to 600 miles, and there did not appear to be any tendency for the signal to decrease in intensity as this distance was approached. A very effective earth aerial was investigated. This consisted of a horizontal wire 3 ft above badly conducting ground, the receiver being connected to one end and kept at the same height, no earth connection being used. For a length equal approximately to half the wave-length used the effective height of such an aerial becomes very large. The effect of the conductivity of the earth is discussed, and the results obtained in the experimental investigations are qualitatively explained on the basis of the present knowledge of transmission phenomena. (a-3, b-1, c-1, d-1, e-0, f-Discussion and analysis)

589. EISNER, F., AND FASSBENDER, H., "Radio in Aeronautics," Proc. IRE, vol. 17, pp. 2185-2229; December 1929. ABSTRACT: The paper gives a review of the present status of radio in aeronautics in Germany. Not only does it describe the apparatus used at the present time in German aircraft communications, but it also gives results of measurements on the fundamentals of radio in aeronautics, which have been made by the Deutschen Versuchsanstalt für Luftfahrt E. V. Further, it indicates the trend that German aircraft radio will probably follow in the next few years. It takes up the subjects of long-wave sets, sets for short- and ultra-short waves, navigation apparatus for aircraft using radio waves, and airship radio sets. Finally, the German organisation for the application of radio in aeronautics is described. (a-1, b-1, c-1, d-1, e-0, f-Survey)

590. KEAR, F. G., AND JACKSON, W. E., "Applying Radio Range to Airways," Proc. IRE, vol. 17, pp. 2268-2282; December 1929. ABSTRACT: A description of the application of the radio range system (directive radio-beacon) to commercial airways. Only the aural type has been put into daily operation, and the paper discusses methods of adjusting the space pattern of the beacon system so that the courses may align with the fixed airways. These beacons also need to be readily distinguished from one another, and so designed that a minimum of interference is met. By using a vertical wire aerial in addition to the loop aerials and varying the relative power in the two loop aerials it was found possible to secure practically any array of courses desired. The field-intensity measurements made gave space patterns which checked very well with the theoretical patterns for such aerial systems. Careful spacing of the ranges within the frequency band, as well as a distinctive coding for each beacon, solved the problem of interference. In selecting the proper coding a study of the physiological effects of various sound groups was made, and the final coding chosen was such as to give a signal of equal time duration on each side of the course. The signals still interlock to give the customary long dash when on the course. The technique of applying these modifications was developed to the point where the adjustments could be made by the installation crew in the field without the aid of an engineer. (a-3, b-1, c-1, d-1, e-0, f-Description)

591. LEA, N., "The Calibration and Correction of Naval Direction Finders," Marconi Rev., vol. 15, p. 1821; December 1929. See also Wireless Engineer, vol. 7, p. 218; 1930. ABSTRACT: From Mesny's equation, error/dial reading curves can be derived for various maximum aptitudes. With a family of such curves it is a simple matter to find by test which curve best fits a particular ship, and a common correcting method (which must obey the same law as the errors) can then be applied and adjusted. The Marconi method of shunting one of the Bellini-Tosi loops by means of a choke does follow the tangent law. (a-6, b-1, c-1, d-5, e-0, f-Description)

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592. BUSIGNIES, H., "A New Radio Compass," Onde Elec., vol. 9, pp. 397-415; 1930. ABSTRACT NO. 1: A D/F system using two crossed, fixed loops (with or without a sense antenna), or a small rotating loop is described. ABSTRACT NO. 2: This consists of two similar fixed perpendicular receiving frames, at right angles to each other, in series with two similar coupling coils. At the centre of the latter is a tuned coil C rotated by a motor-operated spindle, which also carries the permanent magnet of a moving-coil galvanometer. The moving coil of the latter is excited by rectified current from the coil C after hf and lf amplifications and carries a pointer moving over a circular scale. When receiving, the reception passes through a maximum for every revolution of the spindle, viz, when the coil C and the magnet coincide with the direction of the transmitter: since the rectified current is also a maximum at the same instant, the moving coil will also set itself in a corresponding direction which will be indicated by the scale reading of the pointer. The theory of operation is given, and the cause of errors and the sensitivity are discussed. Practical results are given in its application to aerial and marine navigation. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

593. DE MAROLLES, R. J., "The Loth Navigation System," Aircraft Eng., vol. 2, p. 107; 1930. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

594. GLOECKNER, M. H., "Airplane Direction Finders," J. Franklin Inst., vol. 209, p. 684; 1930. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

595. GLOECKNER, M. H., "Direction-Finding for Aircraft," D.V.L. Jahrbuch, Spec. issue, pp. 571-578; 1930. See also Experimental Wireless, vol. 8, p. 271; May 1931. ABSTRACT: A report on the usefulness of various methods of direction-finding for the navigation of aircraft. (a-6, b-1, c-4, d-4, e-0, f-Evaluation)

596. HARMS, M., "A New Method of Direction-Finding by Wireless," Mariul Luftf. Ruridschau, vol. 2, p. 513; 1930. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

597. ANONYMOUS, "Receivers for Direction-Finding," Experimental Wireless, vol. 7, p. 28; January 1930. ABSTRACT: Notice of British patent application no. 319418. Concerns a multi-tube, well-shielded receiver suitable for D/F. (a-6, b-1, c-1, d-5, e-0, f-Patent notice)

598. CLERIOT, M., "Interlocked-Signal Direction Finder in a Rotating Form," Lorenz Berichte; January 1930. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

599. DUCKERT, P., "Position-Finding from Three D/F Bearings," E.N.T., vol. 7, pp. 15-18; January 1930. ABSTRACT NO. 1: Three bearings give a triangle instead of a point of intersection. Owing to possible errors and variations of D/F bearings due to weather conditions, it cannot be assumed that even if a point intersection is obtained, this point gives the ship's position with certainty. ABSTRACT NO. 2: A discussion is given of the problem of determining the position of a ship from D/F bearings of three stations, bearing in mind the fact that three such bearings almost invariably give a triangle instead of a point intersection. Owing to possible errors and variations of D/F bearings due to weather conditions it cannot be assumed that even if a point intersection is obtained this point gives the ship's position with certainty, as is easily seen if the ship is located on the circle through the three D/F stations, when rotation of the direction lines from the stations through a considerable angle in either sense will give another point intersection, also on the circle. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Discussion)

600. DRAKE, F. H., "Receivers for Direction-Finding," Experimental Wireless, vol. 7, p. 28; January 1930. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

601. MURPHY, W. H., "The Cause of Errors in Goniometry when Bearings of Relatively-Close Loop Transmitters Are Being Ascertained," Jour. Maryland Acad. Sc., vol. 1, pp. 46-52; January 1930. See also Wireless Engineer, vol. 7, p. 573; October 1930. ABSTRACT: The writer's mathematical examination of the radiation and induction components of the fields of a loop transmitter, and of the planes of polarization of these components shows the reasons for errors in bearings obtained with D/F's in aircraft on transmissions from beacon loop antennas. The conclusion is reached that there are likely to be large errors in bearings taken on loop transmitters, except at distances greater than 5 or 6 wavelengths. (a-6, b-1, c-1, d-1, e-0, f-Analysis)

602. BERNDORFER, F., AND DIECKMANN, M., "A Unilateral Direct-Reading Direction Finder with Rotating Goniometer Coupling Coils," Zeit. f. Hochf., vol. 35, pp. 98-105; March 1930. See also Wireless Engineer, vol. 7, p. 397; 1930. ABSTRACT NO. 1: In this type of D/F the search coil of a goniometer, whose field coils are

connected to two crossed loops, is rotated continuously and is coupled with a definite gear ratio to a 3-phase generator. The rf current derived from the antenna loops, and modulated by the rotation of the search coil, is taken to a receiver. The signals from a vertical antenna is superposed on this current. After amplification, the signal is led to the moving system of a phase meter, which is of the "power factor meter with 360° scale" type and which has its rotating field supplied by the 3-phase generator geared to the rotating search coil. Since the phase of the current led to the moving system varies with bearing of the incoming signal, this arrangement gives a direct indication of the bearing on a 360° scale. ABSTRACT NO. 2: A direct-indicating direction-finding apparatus, working on the goniometer principle, is described. By the use of a rotating coupling coil in the goniometer and utilisation of energy from a plain open aerial, a low-frequency alternating current is generated whose phase depends on the angle of incidence of the received waves. The phase is read on a 0°-360° phasemeter working on a generator whose axis is suitably coupled to the rotating goniometer coil. Tests of the apparatus showed a dependence of the reading on the rate of revolution of the coil and, outside a certain region, on the strength of the phase currents. With a definite rate of rotation and constant currents good results were obtained. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

603. DELLINGER, J. H., DIAMOND, H., AND DUNMORE, F. W., "Development of the Visual Type Airway Radio Beacon System," Bureau of Standards, Journal of Research, vol. 4, pp. 425-459; March 1930. See also Proc. IRE, vol. 18, pp. 796-839; May 1930. ABSTRACT: The beacon described is a development of the original "A" "N" equi-signal beacon in which the "A" and "N" have been replaced by modulating the two radio channels, one at about 65 ~ and the other about 87 ~ per second. On the actual course the two signals are of equal strength. This condition is indicated to the pilot by a special reed-indicating unit which is connected to the output of his radio receiver. The reed unit consists of two reeds carrying flags on their extremities similar to the reeds employed in a frequency meter. When the signals from the two beacon loops are of equal strength, then the two reeds vibrate with equal amplitude and the pilot knows that he is on the correct course. Off the course one reed vibrates with a greater amplitude than the other, thus showing the pilot which way to turn to regain the correct course. Various types of beacon transmitters are described capable of indicating up to a maximum of 12 courses at any desired angles. Descriptions are also given of the apparatus carried in the aircraft and the problem of shielding the ignition system on the aircraft engine. A marker beacon has been developed to indicate to the pilot visually his exact position at definite points on the route. Special adaptations of the beacon system are being developed to assist pilots to land in fog. (a-3, b-1, c-1, d-1, e-0, f-Description)

604. DIAMOND, H., AND GARDNER, F. G., "Engine Ignition Shielding for Radio Reception in Aircraft," Bureau of Standards, Journal of Research, vol. 4, pp. 415-424; March 1930. See also Proc. IRE, vol. 18, pp. 840-861; May 1930. ABSTRACT: A metallic ignition manifold is employed with h t cable drawn through in the usual way. The leads from manifold to spark plug and the groups of leads from manifold to magneto outlets are enclosed in liquid-proof flexible aluminium tubing, with external copper braiding. The magnetos are provided with covers which completely enclose the distributor blocks. A single outlet permits the use of an elbow fitting for connection to the large flexible metal tubing; outlets are provided in the elbows for the booster and earth leads. The spark plugs are integral with the shield, and are provided with elbows for connection to the smaller flexible tubing; the ignition switch and booster magneto are metallically enclosed. (a-3, b-1, c-1, d-1, e-0, f-Description)

605. DIAMOND, H., AND KEAR, F. G., "Twelve-Course Radio Range for Guiding Aircraft with Tuned-Reed Visual Indication," Bureau of Standards, Journal of Research, vol 4, pp. 351-369; March 1930. See also Proc. IRE, vol. 18, pp. 939-962; June 1930. ABSTRACT: The paper describes a radio directive beacon (or radio range) of the visual indicating type, which provides radio-marked courses at air terminals where more than four airways converge. The 12-course radio range is similar to the double modulation type, with the addition of a third amplifier train and accompanying modulation frequency. It provides twelve equi-signal zones which may be oriented within wide limits and made to coincide with the converging air routes. In order to prevent coupling between amplifier branches special means are employed to supply them successively rather than simultaneously. For this purpose 3-phase radio-frequency currents, derived from a conventional single-phase oscillator by means of a phase divider, are used to energise the amplifiers. Means for aligning the resultant space patterns with the airways are also discussed and examples are given. (a-3, b-1, c-1, d-1, e-0, f-Description)

606. UDA, S., "Direction Finder for Extremely Short Waves below One Metre," Journal IEE, Japan; March 1930. See also Experimental Wireless, vol. 8, pp. 99-100; also pp. 267-271; February 1931. ABSTRACT: Notes on the use of the Yagi-Uda array as a direction finder. (a-6, b-1, c-6, d-6, e-0, f-Description)

607. APPLETON, E. V., "On Some Measurements of the Equivalent Height of the Atmospheric Ionized Layer," Proc. Roy. Soc., Series A, vol. 126, pp. 542-569; 3 March 1930. ABSTRACT: In previous papers various experimental methods of examining the characteristics of downcoming wireless waves have been described. Of these methods by far the most useful has proved to be that which involves a small continuous change of transmitter wave-length, by means of which there is produced at a receiving station a succession of interference maxima and minima between ground waves and waves deviated by the upper atmosphere. An account is given of numerous measurements made by this method at Peterborough, using transmissions from the BBC transmitters at Bournemouth and Birmingham and from Teddington (NPL). The wave-lengths chiefly used were between 300 and 500 m, and most of the observations were made about the period of sunrise. The results obtained confirm previous ones as regards the more frequent types of nocturnal variation of the equivalent height of the ionised layer, but two new types of variation have been observed. On certain mornings heights comparable with those found normally after sunrise (of the order of 100 to 105 km) have been registered throughout the whole period of observations even when measurements were begun as much as two hours before sunrise. Many cases have been noted in which there appear to be present secondary rays which have been twice reflected by the layer, but in other cases the results appear to show the presence of a second reflecting layer at a considerably greater height. The results are discussed, and possible explanations of the observed effects are given. (a-3, b-1, c-1, d-5, e-0, f-Description)

608. DUNMORE, F. W., "Tuned-Reed Course Indicator for the 4- and 12-Course Radio Aircraft Range," Bureau of Standards, Journal of Research, vol. 4, pp. 461-474; April 1930. See also Proc. IRE, vol. 18, pp. 963-982; June 1930. ABSTRACT: This indicates, on the 12-course system, when the aircraft is on any one of the 12 courses, and, if off, approximately how many degrees, and whether to the right or left, and indicates to the pilot, if lost, which course he is nearest, how to turn to get on it, and which way he is flying on it. This is accomplished by three reeds in the visual indicator, each being tuned to one of the modulation frequencies, 65, 86.7 or 108.3, sent out by the radio range. Unequal amplitudes of reed vibration indicate that the plane is off the course to the side of the reed of greatest amplitude. A windowed shutter in front of the reeds exposes any two at a time, the correct two for a given course being determined by a colour system. (a-3, b-1, c-1, d-1, e-0, f-Description)

609. KENNELLY, A. E., "Magnetic Disturbances and Long-Distance Reception," Electronics, vol. 1, no. 1, pp. 42-43; April 1930. ABSTRACT: Radio cosmic service by broadcasting of bulletins regarding atmospheric conditions from Eiffel Tower of Paris, a service of the Union Radio Scientifique Internationale, is referred to; importance of these bulletins for radio, meteorological, astrophysical and geophysical circles is stressed and necessity of broadcasting is pointed out; information has just been received that this information will be rebroadcast from FYL at wavelength of 16,900 m and from short-wave station FLJ on wavelength of 32-1/2 m at 3 pm Eastern Standard Time. (a-3, b-2, c-1, d-1, e-0, f-Propagation information)

610. TANIMURA, I., "Some Experiments on Night Errors for Long Waves," Proc. IRE, vol. 18, pp. 718-722; April 1930. ABSTRACT: This paper describes the results of experiments on night errors observed for a 19.7-kc station located at a distance of 148 km and compares them with the results of theoretical analysis. Cyclic variations of bearings, mostly two, are noticed at sunset and the same at sunrise in inverse way, the maximum shifts being about 30°. At the moments when the maximum shifts occur the bearings are distinctly observed, while they are broad at others. From observations using a horizontal loop and a unidirectional aerial, polarisation angles and intensities of space waves are found after Eckersley's process, assuming or empirically determining phase differences between surface and space waves, incident angles of space waves and intensities of reflected waves on the ground. It is pointed out that the observed and theoretical values of bearings and their broadness are in good agreement. (a-1, b-1, c-1, d-1, e-0, f-Description)

611. SMITH-ROSE, R. L., "Radio Direction-Finding by Transmission and Reception," Nature, vol. 125, pp. 530-532 and pp. 568-569; 12 April 1930. ABSTRACT: A brief, general survey of the subject more especially with reference to its application to marine and aerial

navigation. Mention is made of the Adcock principle for overcoming night errors and its possible application to the rotating loop type of beacon as developed by the Royal Air Force. (a-3, b-1, c-1, d-5, e-0, f-Survey)

612. ANONYMOUS, "Model DJ Radio Direction Finder, Frequency Range, 1000 to 4525 KC," Westinghouse Electric Corporation, Baltimore, Maryland, Instruction Book IB5556; 30 April 1930. See also Department of Commerce PB17433. ABSTRACT: The Model DJ Direction-Finder is of the Bellini-Tosi or fixed loop type, using a goniometer to determine the bearings. The equipment operates on frequencies from one thousand kilocycles to four thousand five hundred and twenty-five kilocycles. Three plug-in units are used in the receiver to cover this wide frequency range. The Model DJ Direction Finder was designed to be mounted on the upper structure of a ship with the loop mounted as high as possible and connected to the receiver by means of the lead-in conduit. The apparatus comprising this direction finder consists of a Bellini-Tosi loop; a main assembly housing a goniometer, mechanical compensator, receiver, battery charger and batteries, and a conduit containing a transmission line between the loop and main assembly. The unit has been designed so that the main assembly may be mounted in the foretop of a ship and the loop on the foretop canopy. The loop consists of two windings placed at right angles to each other, and shielded by aluminum tubing and cast aluminum fittings. The loop pedestal is made in two parts so that the loop may be easily removed without disturbing the transmission line. This feature is provided to allow a ship carrying the direction finder to pass under bridges that clear the foretop canopy by as little as fifteen inches. Connections between the loop and the pedestal are made by means of heavy jacks and plugs. Three guide pins are provided in the flange of the pedestal so that the loop may be removed and replaced in its original position without injury to the plugs or possibility of wrong connection to the transmission line. A cast aluminum cover is provided to cover the plugs in the lower half of the pedestal after the loop has been removed. The loop assembly and the pedestal with the protecting cover attached are made to be watertight. The main assembly consists of a splashproof cabinet having doors, which give access to the receiver and batteries. The cabinet is divided into four compartments. The goniometer, with sense and antenna balance controls, is located in the top compartment. Directions are indicated by the position of a set of cross-hairs in relation to a compass chart, which is visible through a glass window in the top of the cabinet. The cross-hairs and the movable coil in the goniometer are actuated by a hand-wheel on the upper front of the cabinet. A pilot lamp mounted to the top of the cabinet is adjustable to illuminate the compass chart. The second compartment (below the goniometer) contains the receiver. The door covering this unit swings downward providing a desk for the operator. Two sets of receptacles, located just over the receiver panel, provide space for the plug-in units which are not in use. The receiver power supply cable, plugs into a jack in the rear of the receiver compartment and is of sufficient length to allow the receiver to be operated while sitting on the shelf. The input and ground connections are made when the receiver unit is in place. The third and fourth compartments, covered by a pair of doors, contain the battery charger and the batteries respectively. The third compartment also contains available space for the spare part box and any miscellaneous small items. The transmission line, between the loop and the main assembly, consists of a pair of wires from each winding of the loop. They are spaced and supported in a length of aluminum tubing, which is complete with elbows and fittings for connection between the loop pedestal and the main assembly. The Bellini-Tosi loops consist of two windings of twelve turns each. The windings are strung through insulating strips, placed at each corner of the loop. These separate the turns from each other and the case. The aluminum case enclosing the windings has insulating collars inserted at the top so that the characteristics of the loops are not impaired by a closed circuit in the shielding. The leads from each of the loops are run as symmetrically as possible to the jacks which are mounted at the base of the loop. The leads from the loop are run through the conduit to the goniometer in the upper compartment of the main assembly in the form of a transmission line in which the leads are separated to provide a minimum of capacity to the shield and also a minimum of unbalance between loops. Due to the fact that the loops act as miniature antennas (the "antenna effect"), and also the fact that guy wires, stacks, etc., introduce out-of-phase voltages, it is impossible to obtain perfect null points when taking a bearing with the loops alone. To overcome this difficulty a balancing antenna is used,..." (a-1, b-3, c-1, d-1, e-845, f-Instructions)

613. BARFIELD, R. H., "Recent Developments in Direction-Finding Apparatus," Experimental Wireless, vol. 7, pp. 262-265; May 1930. See also JIEE, vol. 68, pp. 1052-1069; Disc., pp. 1069-1075; August 1930. ABSTRACT NO. 1: Includes some notes on improvements to the basic Adcock system, and in particular, arrangements permitting the receiver to be located on the ground instead of elevated to the plane of centers of the vertical dipoles. ABSTRACT NO. 2: In this paper three forms of equipment for direction-finding are described: a fixed system, operating on the Adcock principle, for waves of the order of 300 to 600 m, and two rotating systems, one a screened loop and the other an Adcock formed by a single pair of spaced, vertical aerials. The fixed medium wave equipment differs from the original Adcock in that the operating hut is at ground level and the aerial system is asymmetrical. This asymmetry is corrected by connecting the lower limbs of the aerials to earth through a balancing condenser, which is so adjusted as to match the impedance of the upper limb over the working range of frequencies. Both on actual stations and and on tests with an elevated transmitter this system is shown to be superior to an ordinary rotating-loop, direction-finder, through there are still errors remaining which the author hopes to eliminate as the result of further investigation. In the Discussion, N.E. DAVIS described the Marconi adaptation of the Adcock principle, which consists in connecting four spaced, vertical aerials to the radio goniometer by means of completely screened horizontal leads, the screens being earthed at frequent intervals. The results obtained with this equipment are given, showing the maximum error on wave-lengths of 1000 m to be not more than 2° or 3° under the worst conditions of night effect. The two rotating equipments are for use on wave-lengths of the order of 12 to 60 m and are both equally satisfactory in the absence of any downcoming radiation. With downcoming radiation, however, the Adcock system remains effective, while the rotating loop becomes quite useless. The short-wave Adcock equipment will give results accurate to within 5° at very long ranges over 500 m, and at very short ranges under 20 m to within 2°. At intermediate ranges results are variable, and minima too flat for any useful indication. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

614. DAVID, P., "Radio-Electric Systems for Guiding Ships and Aircraft," Onde Elec., vol. 9, p. 197; May 1930. ABSTRACT NO. 1: A survey and classification of all methods used in D/F before 1930. The qualities of a good D/F system are discussed. A bibliography of 65 references is given. ABSTRACT NO. 2: A general and very useful review of the various methods, both proposed and in use, for the assistance of ships and aircraft by means of radio direction-finding, radio beams, rotating radio beacons, and leader cable. There is a bibliography of 64 references. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Survey)

615. DAVIS, N. E., "The Marconi-Adcock Direction Finder," Marconi Rev., No. 21, pp. 1-8; June 1930. See also Wireless Engineer, vol. 7, p. 511; 1930. ABSTRACT: This paper discusses some of the errors to which direction-finders are subject and traces the development of the Marconi-Adcock system through such steps as the 1919 Adcock patent, modification by Smith-Rose and Barfield, and Eckersley's design with buried and shielded leads. (a-6, b-1, c-1, d-5, e-0, f-Discussion)

616. RATCLIFFE, J. A., AND WHITE, "Negative Attenuation of Wireless Waves," Nature; June 1930. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

617. VAN der POL, B., AND NIESSEN, K. F., "The Propagation of E-M Waves over a Plane Earth," Ann. d Physik, vol. 6, pp. 273-294; June 1930. ABSTRACT: Sommerfeld has given a solution of this problem, the field strength being given as a function of distance, wave-length, dielectric constant and the conductivities of the air and the earth. In the present paper the methods of Heaviside, Carson, and Van der Pol are applied to obtain a simpler solution of the general problem, from which Sommerfeld's approximation for the potential function may be derived. (a-3, b-1, c-4, d-4, e-0, f-Analysis)

618. ANONYMOUS, "Model DK Radio Direction Finder, Frequency Range, 100 to 1000 KC," Westinghouse IB5674, 30 June 1930 (modified in 1933 by U. S. N.). See also Department of Commerce PB17432. ABSTRACT: The Model DK Radio Direction Finder is designed for the purpose of determining the bearings of received signals. It is of the rotating coil type, and is suitable for installation aboard ship or ashore. The equipment consists essentially of: a loop, Navy Type CAY-3867, an indicator and mechanical corrector, Navy Type CAY-3868, and a receiver, Navy Type CAY-3866. The loop, or rotating coil, is enclosed in a waterproof aluminum shell which is supported by and rotates on a cast aluminum pedestal. The pedestal has a flange for mounting on the deck of a vessel or on a flat roof; and has a projecting housing that extends through the deck or roof to support the indicator and mechanical corrector in the room below. The mechanical corrector will, after calibration, automatically shift an auxiliary pointer to indicate the ture direction of a received signal, and thereby compensate for the error deviation caused by objects in the vicinity of the loop. The receiver is of the conventional superheterodyne type. The frequency range, 100 to 1000 Kcs, is covered in three bands by means of a range switch. The

output is delivered to a pair of output jacks through a balanced and shielded output transformer, matched to operate a pair of Navy Type 49003 headphones. An aluminum cabinet completely encloses the receiver, and allcontrols are mounted on the front panel. Four binding posts are provided at the rear for connecting to a 4-volt filament battery and a 100-volt plate battery. The receiver may be mounted on the operator's table. An auxiliary antenna is to be used with the receiver to balance out the "quadrature voltages" in the loop, and to indicate "sense" (or which of the two minima obtained with the loop gives the turn direction). The loop or pick-up device may be divided into two major parts: the above-deck assembly and the below-deck assembly. The total weight of the loop unit, approximately 150 pounds, is supported by the deck. The above-deck assembly, consisting of the loop shell, drive shaft and pedestal, is of waterproof construction for outdoor use. It is ruggedly constructed to withstand wind pressure, the roll and pitch of the vessel through heavy seas, and the shock of gunfire. The loop shell is made up of cast aluminum corners and aluminum tubing sides. An insulating sleeve is placed in one side to prevent the shell from forming a short-circuiting turn around the loop windings. These windings are supported by insulating blocks set diagonally in the corners of the loop shell. The shell rotates about a vertical diagonal in a 50-inch diameter circle. The supporting corner of the shell is a cast aluminum "Y," which effects rugged connection to the main shaft and a waterproof joint between the shell and the pedestal. The pedestal, a single aluminum casting, has a flange for fastening to the deck. Between the flange and the deck may be placed two wedge-shaped wooden cribs or washers to compensate for the rake and crown of the deck, and thereby maintain the loop in a vertical position. The loop drive shaft is supported by ball bearings located inside the pedestal. Both pedestal and loop are left unfinished so that they may be painted after installation to match adjacent finishes. A portion of the pedestal projects through the deck and houses the slip rings, grounding brush, and lower bearing of the main drive shaft. Support of the below-deck assembly is also afforded by this projection. This assembly and the main drive shaft are so designed that the apparatus may be installed in a high or a low compartment, within limits. The below-deck assembly consists of the main drive shaft (or inner extension tube), the outer extension tube, the indicator unit, the parts housed by the lower projection of the pedestal and the condulet fitting attached to it. The main drive shaft connects the loop shell to the indicator. It is made of aluminum and is tubular in cross-section for maximum strength. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

619. ANONYMOUS, "Classification of Radio Subjects: An Extension of the Dewey Decimal System," Proc. IRE, vol. 18, pp. 1433-1456; August 1930. ABSTRACT: A systematic scheme of classification of subjects in radio science and engineering is necessary in classifying references to current radio publications and also for classifying all sorts of other radio material, such as reports, reprints, drawings, books, apparatus, etc. In an effort to fill the need for a radio classification this extension of the Dewey decimal system was prepared. Since the publication of the first edition of this circular, in 1923, the subject classification it presents has been used extensively by many radio research workers and engineers as well as by the radio section of the Bureau of Standards. The present edition brings the classification up to date and makes a few changes which use has shown to be necessary. (a-2, b-1, c-1, d-1, e-0, f-Description)

620. SOUTHWORTH, G. C., "Factors Affecting Gain of Directive Aerials," Proc. IRE, vol. 18, pp. 1502-1536; September 1930. ABSTRACT: Two aerials separated in space by 1/4 wave-length and in phase by 1/4 period give more radiation on one direction than in the opposite, and forms a unidirectional couplet. A number of these couplets may be arranged in linear array, thereby giving a directive system. Diagrams are shown for such arrays as affected by the number and spacings of the individual couplets. The gains from such arrays are calculated, and data are given showing fair agreement between calculation and observation. Directional diagrams for arrays of coaxial aerials indicate that somewhat less gain may be expected from this form than when the elements are spaced laterally. Combinations of these two types of arrays give marked directional properties in both their horizontal and vertical planes of reference. The effects resulting from combining two or more arrays are also discussed: in one case the space between two arrays tend to emphasize spurious lobes. The directional diagram of such a combination may be rotated within limits by changing the phasing between adjacent arrays on sections of an array. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

621. DIAMOND, H., AND DUNMORE, F. W., "Radio Beacon and Receiving System for Blind Landing of Aircraft," Bureau of Standards, Journal of Research, vol. 5, pp. 897-931; October 1930. ABSTRACT: A radio beacon and receiving system is described for use at airports to permit the blind landing of aircraft under conditions of no visibility. The system comprises three elements to indicate to the pilot the position of the aircraft as it approaches and reaches the instant of landing. The lateral position (that is, the landing field runway direction) is given by a small directive beacon of the same type as employed for guidance on the airways, differing only in the use of smaller loop aerials and lower power. The longitudinal position along the runway (that is, the approach) is given by a marker beacon. The height is given by an inclined ultra hf radio beam, used in such a way as to provide a very convenient gliding path for the landing aeroplane free of all danger from obstructions. The same medium-frequency receiving set required for obtaining radio-telephone and radio-range beacon service on the airways is utilised for receiving the runway localising and marker beacon signals. The course indications of the runway localising beacon are observed on the same vibrating reed indicator as employed on the main radio range beacon, automatic control of receiving-set sensitivity being provided to maintain substantially constant reed deflections regardless of the distance between the aeroplane and transmitting station. The marker beacon indications are received aurally. A special hf receiving set is required to receive the landing beam signals. The rectified output current of this set is passed through a dc microammeter mounted on the instrument board. By keeping the deflection of this microammeter at a fixed value, the pilot directs the aeroplane along the curved path coinciding with the line of equal intensity of received signal below the axis of the beam. The relative position of the aeroplane with respect to this convenient landing path is indicated by the rise or fall of the microammeter deflection above the fixed value. (a-1, b-1, c-1, d-1, e-0, f-Description)

622. FARNES, G. H., AND HOLLINGHURST, F., "Radio Direction Finding at Post Office Coast Stations," Post Office Electrical Engineers Journal, vol. 23, part 3, pp. 211-215; October 1930. ABSTRACT: After careful examination of problem it was decided in 1921 to investigate possibility of utilizing existing coast stations of British Post Office and corresponding ships' installations for service; under this method no special apparatus would be required on ships, bearing of ship being taken at coast station by special receivers at that station utilizing signal from ordinary ship's transmitting set; system and receiver equipment are outlined. (a-3, b-1, c-1, d-5, e-0, f-Description)

623. GLOECKNER, M. H., "Wireless Direction-Finding as an Aid to Aerial Navigation," Marconi Review, no. 16, p. 17; October 1930. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

624. BIOT, M., "Method of Guiding Aircraft," Onde Elec., vol. 9, pp. 520-526; November 1930. ABSTRACT: The method described does not permit the "guiding" of aircraft in the usual sense of that word, but gives information to the pilot of his position from knowledge of the path traversed. For this purpose two synchronous wireless c.w. transmissions of identical frequency are sent out from stations A and B at the starting and finishing points of the flight. These transmissions produce in the path to be traversed by the aircraft a zone of interferences whose successive maxima and minima can be counted by suitable registering apparatus attached to the aircraft receiver. The distance from the start point is then easily found from the known wave-length. Several variants of the method are briefly described. (a-3, b-1, c-3, d-3, e-0, f-Description)

625. FRANCK, P., AND BOURGONNIER, C., "Comments on the Loth-Bourgonnier Radio-Beacon System," Onde Elec., vol. 9, pp. 553-581; December 1930. ABSTRACT: In this article there is a criticism by Franck of the system recently propounded by Bourgonnier, followed by a reply from Bourgonnier, a further explanation by Franck, and a final reply by Bourgonnier. The main ground for criticism is that the channel defined by this system is too wide to be of practical use to aircraft, a detailed theoretical analysis being given by Franck in support of this view. In reply, Bourgonnier states that the analysis is not rigorous, and shows that by means of a graphical method different and more accurate results may be obtained. This point is again disputed and reaffirmed. Another point of disagreement is the question as to the rate at which the distinguishing dots and dashes can be sent and received; whereas Franck considers one second as the minimum time, Bourgonnier states that a fifth to a quarter of a second is ample. Bourgonnier points out that demonstrations on a small scale have been successfully given at Vaux-sur-Seine, but Franck is none the less of the opinion that the system will prove of little practical value on the large scale. (a-3, b-1, c-3, d-3, e-0, f-Evaluation)

626. JACKSON, W. E., AND BAILEY, S. L., "Visual Type of Radio Range Transmitter Having a Universal Application to Airways," Proc. IRE, vol. 18, pp. 2059-2101; December 1930. ABSTRACT: This paper deals with the development of a visual type of radio range for universal application to the civil airways of the United States. Following a discussion of the relative merits of the aural and visual systems of course

indication, the theory of the production of 12 courses by utilising a 3-phase radio-frequency source is presented, followed by a general description of the transmitter. The necessary requisites of goniometer design are touched upon, and performance curves of the final goniometer illustrate the effect of these factors on the results. The detrimental effects of cross-couplings between the loop aerials are pointed out, and methods are given for eliminating these couplings. Further discussion covers the advantages of neutralisation in the transmitter, the relative merits of various types of interstage coupling, and the method used to obtain and determine a 3-phase radio-frequency supply. A description of the installation includes a discussion of the characteristics of the loop aerials used for transmission, together with a measured field-intensity curve. A course indicator is developed which is useful in aligning and monitoring the courses. Polarspace patterns of reed amplitude show the characteristics of the courses obtained with the 2-, 4- and 12-course ranges. The installation is designed to give continuous operation with a minimum of interruption due to failure of the apparatus, a condition necessary to the establishment of an aid to air navigation. (a-1, b-1, c-1, d-1, e-0, f-Description)

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627. ANAONYMOUS, "A Special Form of Direction Finder for the Interior of an Aircraft," Army Air Force; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

628. BARNER, "D/F Loops Inside Metal Aircraft," Army Air Force, Wright Field, Dayton, Ohio; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

629. BARNER AND PIPPEL, "Special Form of Internal D/F Loop for Aircraft," Army Air Force, Wright Field, Dayton, Ohio; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

630. BERNDORFER, F., "Rapid D/F with CRT Indicator," Army Air Force, Wright Field, Dayton, Ohio; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

631. BERNDORFER, F., "Rapid D/F with Glow Lamps," Army Air Force, Wright Field, Dayton, Ohio; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

632. JOHNSTON, A. L., "Radio Direction-Finding for Aircraft," Army Air Force, Wright Field, Dayton, Ohio, Technical Report; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

633. REDGMENT, P. G., "Statistical Study of D/F Errors of a Group D/F Station," Admiralty Signal Establishment (British) Report; ca 1931 (or prior to). ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

634. SODEN, "Compensated (Loop-Dipole) D/F for Ground Stations," Army Air Force, Wright Field, Dayton, Ohio; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

635. APPLETON, E. V., "Polarization of Downcoming Wireless Waves in the Southern Hemisphere," Nature, vol. 128, p. 1037; 1931. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

636. BELLINI, E., "Analyse d'une Communication de M. Barfield a l' Institution of Electrical Engineers sur le progres recent en Radiogoniometrie," Soc. Fr. Elec. Bul., vol. 1, p. 140; 1931. ABSTRACT: Refers to R. H. Barfield, "Recent Developments in Direction Finding Apparatus," JIEE, vol. 68, p. 1052; 1930. See Abstract no. 613. (a-4, b-1, c-3, d-3, e-0, f-Reference)

637. BERTIN, C. H., "The Determination of a Point by a Radio Direction Finder," Comptes Rendus, vol. 193, p. 394; 1931. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

638. ECKERSLEY, T. L., AND TREMELLEN, K. W., "World Communications with Short Waves," World Engineering Conference Proc., pt. 2, Tokyo, Japan, 1929; vol. 20, p. 177; 1931. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-0)

639. FASSBENDER, H., "Annual Report of the Wireless Division of the German Aircraft Research Establishment," ETZ, vol. 52, p. 1026; 1931. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

640. GLOECKNER, M. H., "Contribution on Aerial Direction-Finding," DVL Jahrbuch: vol. 5, p. 672; 1931. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

641. KUBA, R. E., "A Method for Computing Errors in Phase Comparison Systems Caused by Mutual Reflections and a Proposed Solution for Minimizing These Errors," USN, BuShips; ca 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

642. LADNER, A. W., "A Graphical Synthesis of Aerial Arrays," Marconi Review, no. 33, p. 11; 1931. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

643. MARTY, M. P., "Australian Radio Research Board Results with Cathode-Ray Direction Finder," Journal CSIR Australia, vol. 4, p. 244; 1931. ABSTRACT: Not available. (a-4, b-1, c-1, d-11, e-0, f-0)

644. MATTHEWS, S. J., "A Watch Compass for Navigational Direction-Finding," J. Sci. Instruments, vol. 8, p. 327; 1931. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

645. NAMBA, S., YOKOHAMA AND TANIMURA; TANIMURA AND ISO, E., "Papers Dealing with the Propagation of Waves Read before the April 1931 Joint Annual Convention of the Three Electrical Institutes in Japan" 1931. ABSTRACT: Not available. (a-4, b-0, c-6, d-6, e-0, f-0)

646. SMITH-ROSE, R. L., "The Orfordness Rotating Beacon and Marine Navigation," R. R. B. Special Report No. 10, His Majesty's Stationery Office; 1931. ABSTRACT: Not available, see Abstract 546. (a-4, b-3, c-1, d-5, e-0, f-0)

647. VERDURAND, A. B., "The Loth System for Guiding Aeroplanes by Wireless," Genie Civil, vol. 108, p. 473; 1931. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

648. BUREAU, R., "A Recording D/F and Its Application to Atmospherics," Comptes Rendus, vol. 192, pp. 170-172; January 1931. See also Science Abstracts, vol. 34, p. 339, June 1931. ABSTRACT: The registering device consists of a neon lamp in the plate circuit of the last valve of a power amplifier. An incoming atmospheric noise causes this lamp to light, and hence to register the disturbance on a rotating photographic paper. By arranging the slit in front of the paper as a helix and rotating synchronously with the frame of the goniometer, both the time and direction of the disturbance are recorded. (a-6, b-1, c-3, d-3, e-0, f-Description)

649. ETIENNE, G., "New Improved Radio Direction Finder Guides Airplanes thru Densest Fogs," Telegraph and Telephone Age, p. 2; January 1931. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0 f-0)

650. ANONYMOUS, "Model DL Radio Direction Finder, Frequency Range, 100 to 1000 KC," Westinghouse Electric Corporation, Baltimore, Maryland, Instruction Book No. IB5676; February 1931 (modified in 1933). See also Department of Commerce PB17431. ABSTRACT: The Model DL Radio Direction Finder is of the rotating coil type and is suitable for installation aboard ship or ashore. The equipment consists essentially of: (1) a loop, Navy Type CAY-3876, (2) an indicator and mechanical corrector, Navy Type CAY-3868, (3) a receiver, Navy Type CAY-4504, and (4) a socket power unit, Navy Type CAY-4469. The loop, or rotating coil, is enclosed in a waterproof aluminum shell which is supported by, and rotates on, a cast aluminum pedestal. The pedestal has a flange for mounting on the deck of a vessel or on a flat roof; and has a projecting housing that extends through the deck or roof to support the indicator and mechanical corrector in the room below. The mechanical corrector will, after calibration, automatically shift an auxiliary pointer to indicate the true direction of a received signal and thereby compensate for the error caused by objects in the vicinity of the loop. The receiver, Navy Type CAY-4504, is of the conventional superheterodyne type, employing two Navy Type 38035 vacuum tubes in

their respective functions of loop coupling tube, and first detector, and six Navy Type 38056 tubes respectively as heterodyne oscillator, two intermediate frequency amplifiers, second detector, beat oscillator and audio frequency amplifier. The frequency range, 100 to 1000 kilocycles, is covered in three bands by means of a range switch. The output is delivered to a pair of output jacks through a balanced and shielded output transformer, matched to operate a pair of Navy Type 49003 headphones. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

651. FISCHER, F. A., "Directive Sharpness of Artificial Characteristic of Arbitrary Arrangement of Radiators in Space," E.N.T., vol. 8, no. 2, pp. 89-91; February 1931. ABSTRACT: Theoretical mathematical analysis. (a-3, b-1, c-4, d-4, e-0, f-Theory)

652. ETIENNE, G., "Radio Direction-Finding and Aerial Navigation," Q.S.T. Français, vol. 7, pp. 47-57; March 1931. ABSTRACT: Description of a D/F for use in aircraft. (a-6, b-2, c-3, d-3, e-0, f-Description)

653. FROMY, E., "Direction and Altitude Finding of Aircraft," Rev. Gen. d'El., vol. 29, pp. 269-273, February 1931. ABSTRACT: Considers the problem of aircraft navigation in general, both for "free" aircraft and those flying fixed routes. Short descriptions are given of several systems, including: ground D/F; D/F in aircraft; rotating radio beacons; fixed, crossed-loop radio beacons; the Aicardi system; and Loth-type beacons. (a-6, b-1, c-3, d-3, e-0, f-Description)

654. GLOECKNER, M. H., "Analysis of Communications of R. H. Barfield on the Recent Progress of Radio Direction-Finding," Bull. S.F.R. Ser. 5, vol. 1, p. 1490; February 1931. ABSTRACT: Not available, see Abstracts 499 and 521. (a-4, b-1, c-3, d-3, e-0, f-Analysis)

655. ANONYMOUS, "Wireless Direction Finding Systems for Marine Navigation," Marconi Rev., pp. 1-11; March, April, 1931. See also Exper. Wireless, vol. 8, p. 388; July 1931. ABSTRACT: A comparison between the Marconi-Bellini-Tosi system and the rotating loop systems used at that time by S. F. R., Telefunken, and R. C. A. (a-6, b-1, c-1, d-5, e-0, f-Description)

656. BOURGONNIER, C., "Antenna Effect of Loops," Onde Elec., vol. 10, pp. 136-140; March 1931. ABSTRACT: A simple analysis of the deformation of the pattern of a loop because of "antenna effect." (a-6, b-1, c-3, d-3, e-0, f-Analysis)

657. HORTON, C. E., "A New Radio Direction-Finder Corrector," Elect. Rev., vol. 108, pp. 443-444; March 1931. ABSTRACT: Summary of a paper by C. E. Horton, which deals with experimental development of radio D/F's for marine purposes. It treats generally the field in the vicinity of a ship and indicates that both semi-circular and quadrantal correctors are required to obtain high-precision readings. This article also describes a system superior to the cardioid system. The device has a main coil and auxiliary coil at right angles. An open antenna is not coupled to the coils. The system amounts to addition of a cardioid to a figure eight with these conditions: (1) emf of cardioid in quadrature with emf of figure eight; (2) the zero of cardioid coincides in direction with one zero of the figure eight. (a-6, b-1, c-1, d-5, e-143, f-Analysis)

658. MARTY, M. P., "Collaboration between Radio and Air Navigation," Onde Elec., vol. 10, pp. 97-120; March 1931. ABSTRACT NO. 1: Description of the first application of radio to aerial navigation: principles of the radio-beacon and applications to D/F: description of a demountable loop and principles of rotating beacons. ABSTRACT NO. 2: Following a brief outline of the development of wireless communication with aircraft, a detailed account is given of the modern equipment of a transmitter and receiver known as A. V. L. 10. In the transmitter oscillatory circuit part of the capacity and the inductance may be varied together, the condenser moving plates and a variometer coil being mounted on a single shaft which can be locked in any desired position. A scale on a drum fixed to the shaft gives the wavelength directly. Power for the set is derived from the 24-V generator and battery supplying light and power for the aircraft, a special generator giving 1500 V being used for h.t on the transmitter. The latter part of the paper describes methods for guiding aircraft by means of wireless, and in particular a radio goniometer and the principle of the radiophare at Abbeville. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

659. PALMER, L. S. AND HONEYBALL, L. L. K., "Optimum Dimensions of Short Wave Frame Aerials," Nature, vol. 127, p. 407; March 1931. See also Wireless Engineer, vol. 8, p. 268; May 1931. ABSTRACT: It is shown that there are several different critical widths and heights for short-wave loop antennas, none of which is equal to 1/2 wave-length. The optimum area of a loop is critical when it is used at wave-lengths comparable to its dimensions. A square or circular loop is said to be less efficient than a properly-proportioned rectangular or elliptical loop. (a-6, b-1, c-1, d-5, e-0, f-Theory)

660. SMITH-ROSE, R. L., AND THOMAS, H. A., "Automatic Recorder for Rotating Beacon Transmitter," Journ. Sci. Instruments, vol. 8, pp. 81-88; March 1931. ABSTRACT: In this arrangement the received signals from the beacon transmitter at Orfordness were caused to operate a sensitive relay so adjusted that its contacts remained made except for a very weak signal. This relay in turn operated a pen, bringing it into contact with the paper carried on the recording drum and so giving a trace except for a small time corresponding to the period of minimum signal. The middle of the blank space was assumed to correspond to the true minimum; when this was checked by simultaneous observations aurally and with a string galvanometer, it was found that the current curve had not the theoretical shape, with the result that the recorder was in error by an amount corresponding to about 0.3° bearing, which was considered satisfactory for the purpose in hand. The drum carrying the recording paper was driven by a phonic motor so geared that it made one revolution per minute synchronously with the beacon. During the rotation of the drum the pen is moved transversely so that a spiral line is traced on the paper, which is wide enough to give a continuous record of about 30 min. The article contains illustrations and photographs showing in detail the construction of the recorder. (a-3, b-1, c-1, d-5, e-0, f-Description)

661. ANONYMOUS, "Development of Fog Penetrating as Aid to Marine and Aeronautical Navigation," Mar. News, vol. 17, no 11, pp. 56 and 60; April 1931. ABSTRACT: Television should provide valuable system of communication between two points which are obscured by fog from direct observation; for instance, two ships could convey to each other by radio television, visual images of their conpass readings; provision of some means for locating position of other vessel and also its approximate distance away can be secured by use of system of fog penetration utilizing beams of invisible radiations, known as "infra red rays"; types of apparatus being employed. (a-3, b-2, c-1, d-0, e-0, f-Television technique suggested for fog penetration)

662. BLONDEL, A, AND BESSON, P., "Radio Direction Finding," Technique Modern, vol. 23, no. 7, pp. 209-218; April 1931. ABSTRACT: Outline of principles and description of various systems and their results in operations; tests in LaPallice with transmitter using loop antenna. (a-3, b-2, c-3, d-3, e-0, f-Summary)

663. DE FORGE, L., "Landing of Aircraft by Means of Radio during Fog," Q.S.T. Francais, vol. 11, pp. 25-28; April 1931. ABSTRACT: Radio and aerial navigation: description of the problem and description of a possible blind-landing system. (a-6, b-1, c-3, d-3, e-0, f-Description)

664. SMITH-ROSE, R. L., "Some Observations on the Orfordness Rotating Beacon," JIEE, vol. 69, pp. 523-532; April 1931. See also Expl. Wireless, vol. 8, p. 195; 1931. ABSTRACT: After a brief historical introduction dealing with the early work on the R. A. F. type of rotating beacon, the author goes on in Sections 2 and 3 of the paper to summarise the results of an extended series of observations at sea, and also on land, by the National Physical Laboratory at Teddington. The author states that the beacon has achieved a large measure of success among the Mercantile Marine, for whom it was intended. It is capable of providing bearings to within an accuracy of 2° to ships at sea as soon as the observers have acquired a little experience with the system. These results are obtained on an ordinary type of ship's two-valve receiver at ranges up to 100 miles at all times, and 250 miles in daylight under favourable conditions. At night time bearings taken at ranges exceeding about 100 miles are subject to night error. (a-3, b-1, c-1, d-5, e-0, f-Survey)

665. DE BELLESCIZE, H., "A Note Recalling Certain Errors Affecting the Indication of Wireless Circuits," Onde Elec., vol. 10, pp. 317-325; May 1931. ABSTRACT: On the antenna effect of loops. The author gives abstracts of his book "Etude de quelques probleme de radiotelegraphie (Gauthier-Villars, 1920, pp. 111-121). Same thing given by Bourgonnier, M., (Onde Electrique, pp. 136-140; March 1931). (a-6, b-1, c-3, d-3, e-0, f-Description)

666. DANTIN, C., "Loth System for Guiding Aircraft by an Electromagnetic Field," Genie Civil, vol. 98, pp. 473-475; May 1931. ABSTRACT: The Loft system for navigation of aircraft, both at a distance, using rotating beacons, and close to an airport, is described. The principle of the Marric filter is explained. (a-6, b-1, c-3, d-3, e-0, f-Description)

667. DIAMOND, H., AND DAVIS, G. L., "Receiving Aerials for Aircraft," Bureau of Standards, J. of Research, vol. 6, pp. 901-916; May 1931. ABSTRACT: The results are given of an investigation of the characteristics of aircraft receiving aerials to devise an aerial arrangement which would have all the desirable electrical properties of the vertical pole aerial without the mechanical difficulties encountered in its use. The aerials studied include those with both forward and backward inclination, the horizontal dipole, the horizontal I, and the horizontal V, the inclined V, the symmetrical transverse T and the symmetrical longitudinal T. A theoretical treatment is given which enables the voltage induced by a radio range-beacon transmitting station to be calculated for any receiving aerial in space, and is used to determine the received voltage, course error and localising effect for each of the types studied. An experimental study was also made to check the theoretical analysis. The results obtained agree very well with the theoretical predictions for each type. The symmetrical transverse T and the symmetrical longitudinal T, with vertical lead-in portions, are both found to fulfil the desired requirements. Neither shows any course errors, and they both give the same received voltage as the vertical pole aerial of much greater actual height, thus reducing the mechanical troubles caused by vibration and ice formation. An Appendix gives the mathematical derivation of the equation used as a starting-point for the throretical analysis (a-1, b-1, c-1, d-1, e-0, f-Evaluation)

668. HORTON, C. E., "The Practical Correction of a Wireless Direction Finder for Deviations Due to the Metalwork of a Ship," JIEE, vol. 69, pp. 623-636; May 1931. ABSTRACT: A general treatment is given of the field of a wireless wave in the vicinity of a ship, from which it is shown that in general both semicircular and quadrantal correctors will be required to obtain precision readings and to correct for deviations due to the ship. Typical forms of semicircular and quadrantal correctors are described, and the principles underlying a new form of sense finder are explained. This sense finder blurs the reciprocal zero, but leaves the true zero as sharp as before, and in the original position. The best position for a D/F on a ship is discussed, and the behavior of correctors during night effect is explained. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

670. ANONYMOUS, "Model DM Radio Direction Finding Equipment, Range 100 - 1000 Kilocycles. Instructions," USN, Bureau of Engineers. See Department of Commerce PR LC17414; June 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

671. ANONYMOUS, "Automatic Radio Compass," Electronics, vol 2, p. 685; June 1931. See also: Wireless Engineer, p. 338, 1931. ABSTRACT NO. 1: Describes an automatic radio compass for use on aircraft. The system is essentially a homing device using a fixed, directional antenna system. The indicator is a "right-left" type of meter located in the cockpit. ABSTRACT NO 2: Two engineers, Gerhard Fisher and G. Kruesi of the Western Air Express Company, have developed an automatic radio compass which can be used on any CW or ICW Department of Commerce station, or any broadcasting station. While the principles of the marine radio compass were generally utilized, the method of operation was entirely changed. The rotating loop had to be abandoned and substituted by a fixed directional antenna system. The taking of bearings by minimum methods were unadvisable due to the extremely high noise level and the enormous speed of aircraft as compared with marine vessels. In the new system two comparatively strong signals are received which are matched against each other in a specially designed tube circuit. Depending on their individual values, they influence an indicator which is installed on the instrument board in front of the pilot. It is quite similar to the ammeter on the dashboard of an automobile, but instead of showing "charge" and "discharge," the aircraft compass is marked "left" and "right." A zero reading is provided in the center. In practice, as the aircraft is flying toward a radio station the needle of the indicator will stay on zero if the plane is in its course. The polarity of the indicator can be so arranged that swinging the plane to the right the indicator needle will point to the left, showing that the radio station is on the left of the pilot and that a left turn has to be made to bring the ship back on its course. An opposite movement will reverse the indication. The new homing system is sufficiently sensitive to allow a plane to find its way to a radio station 200 miles distant. In addition means is provided to indicate the pilot in case he had overflown the radio station he was headed for. In a marine compass an undirectional device takes care of this problem, but when using the aircraft homing system it was found to be necessary only to turn the nose of the ship slightly from its course and the indicator would point toward the radio station. If, for instance, the plane were suddenly turned to the left and the indicator needle pointed to the right, it would be an indication that the radio station was located ahead. If it turned to the left it would be a positive indication that the radio station had been passed. (a_1-6, a_2-2, b-1, c-1, d-1, e-0, f-Description)

672. ASUKAI, M., AND HAYASI, T., "Variation of Bearings Observed in Short-Wave Direction-Finding," Radio Research, Japan Reports, 1, pp 89-93; June 1931: See also Wireless Engineer, vol 9, p. 169; March 1932. ABSTRACT NO 1: Experimental data on bearings taken in the 2-10 Mc band at distances of about 200 miles and about 20 miles. The conclusion was that no bearings of value could be obtained at the long distance and only mediocre ones at the short distance. It is suggested that "there may exist a certain agency to cause variation of bearings of a short wave transmitter even at very short distances." It is further suggested that if this agency is a deflecting layer, it must be at a distance comparable with such short distances. ABSTRACT NO. 2: The direction-finder used consists of a small rotating frame and a super-heterodyne receiver. The frame rotates about its vertical axis, which passes through a hole bored in the upper plate of a shielded box enclosing the receiver. Graphs of the variation of bearings show that the difference between the observed and true bearings varies with time or the position of the sun, the curves being nearly symmetrical about the local noon at the middle position. A certain agency is suggested to cause the variation of bearings of a short-wave transmitter, although its distance is quite small. If this agency is a deflecting or reflecting matter or layer, it will exist at a distance comparable with such a small distance, and the scattered polarised wave will play an important role (a_1-6, a_2-3, b-1, c-1, d-6, e-0 f-Theory and experimentation)

673. BASHENOFF, V. I., AND MJASOEDOFF, N. A., "The Effective Height of a Closed Loop Aerial," Proc. IRE, vol, 19, pp. 984-1018; June 1931. ABSTRACT NO. 1: In this article, formulas are given for the calculations of the effective height of coil antennas with non-quasi-stationary distribution of current. Antennas of triangular, rhombical, rectangular, and pentagonal forms, suitable for use in radio beacons, are treated, and the method of taking account of the distribution of current along the antenna (found by experiment) is discussed. Graphs for facilating numerical calculations using the formulas are given, together with examples illustrating their use. Special attention is given to the determination of those forms of antennas in which the wire is most advantageously placed for obtaining the maximum effective height. ABSTRACT NO. 2: Formulae are given for the calculation of the effective height of coil aerials with non-quasi-stationary distribution of current. Aerials of triangular, rhombical, rectangular and pentagonal forms, suitable for use in radio beacons, are treated, and the method of taking into account the distribution of current along the aerial by experiment is discussed. Graphs for facilitating numerical calculations from the formulae are given, together with examples illustrating their use. Special attention is given to the determination of those forms of aerials in which the wire is most advantageously disposed for obtaining the maximum effective height. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Theory)

674. ETIENNE, G., "Description of a Modern Type of Radio Direction Finder on Board Ship," Science Moderne, vol. 8, p. 322; June 1931. ABSTRACT: Not available. (a-4, b-2, c-0, d-0, e-0, f-0)

675. MARIQUE, J., BRAILLARD, P., AND GOLDSCHMIDT, R. B., "A New Direct-Reading Direction Finder," Onde Elec., vol. 10, pp. 355-362; June 1931. ABSTRACT: Description of a direct reading D/F using a principle described in 1920 by Raymond Braillard and R. B. Goldschmidt in French Patent No, 516, 295. The current received from a loop is amplified and detected and recorded on a rotating output recorder. The new system is based on the same principle except that a polar diagram is traced by means of a luminous spot on a piece of ground glass. ABSTRACT NO. 2: The author has developed into a practical instrument the system originally outlined by Braillard and Goldschmidt in their French Patent No. 516, 295 of December 4, 1920. A continuously rotating coil carries on its axis a sensitive milliammeter whose movement mounts a mirror so arranged as to throw an image of a point source on a ground-glass screen situated with its plane perpendicular to the axis of the rotating coil. A circle of light is thus traced on the screen. Any deflection of the milliammeter movement

alters the radius of this circle. The radio-frequency output from the coil is taken through slip-rings to a receiver, and the audio-frequency signal is rectified to d. c. and fed back through further slip-rings to the milliammeter. As the coil passes through the minimum there is a rapid change of the milliammeter current and consequently an easily observed kink in the curve on the screen. The ambiguity may be avoided by using an open aerial in addition to the coil, and if the speed of rotation so above about ten revolutions per second a continuous curve is seen on the screen, and so a continuous reading can be obtained of the bearing of any station under observation. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description. Note: Science abstracts dates as August 1931)

676. NAMBA, S., AND SHOGO, "Polarization Phenomena of Low-Frequency Waves," Radio Research, Japan Reports, 1, pp. 41-61; June 1931. See also Proc. IRE, vol. 19, pp. 1988-1999; November 1931. ABSTRACT NO. 1: Presentation and discussion of experimental data on the polarization state of downcoming 20 kilocycle radio waves (in Japan). ABSTRACT NO. 2: Using an oscillograph of the Braun tube type observations were made of the polarization of the downcoming wave of the transmissions from the high-power, L/F stations JAA and JND, 150 and 360 km, respectively, from the observation point. The downcoming wave was found to be almost plane-polarised during the daytime with its electric force nearly in the vertical plane. A quick change occurs at sunset, the wave being then changed to a state of elliptical polarisation. The wave from the station JAA, located north of the observing station, is of the plane-polarised form slightly inclined in the counterclockwise direction during the daytime, while at night it changes into a state of elliptical polarisation of small eccentricity. The sense of rotation is always left-handed. The wave from the station JND located WSW is, throughout the day and night, nearly plane-polarised and slightly inclined in the clockwise direction. The sense of rotation is irregular, being sometimes right-handed and sometimes left-handed. At sunset and sunrise quick changes occur and at sunset several results show a double transition phenomenon. Seasonal variations in polarisation could not be detected. (a_1-6, a_2-3, b-1, c-1, d-6, e-0, f-Experiment and analysis)

677. NAMBA, S., ISO, E., AND UENO, S., "Polarization of High-Frequency Waves and Their Direction-Finding," Radio Research, Japan, Reports, 1, pp. 63 88; June 1931. See also Proc. IRE, vol. 19, pp. 2000-2019; November 1931. ABSTRACT NO. 1: Experimental data and discussion of polarization of received radio signals after reflection by the ionosphere. ABSTRACT NO. 2: A single doublet was used for measuring polarisation. The doublet can be rotated about three axes at right angles, thus enabling three components of the electric vector to be measured. An Adcock aerial was used for direction measurements. It is concluded that the waves are in general elliptically polarised, but the state of polarisation depends markedly on the distance. At short distances the polarisation is mainly horizontal. It is further concluded that over long distances the path of short waves is not always that of the great circle. (a_1-6, a_2-3, b-1, c-1, d-6, e-0, f-Description)

678. ANONYMOUS, "The Marconi-Adcock Direction-Finding Aerial," Marconi Rev., vol. 31, pp. 21-24, July; August 1931. See also Wireless Engineer, vol. 8, p. 619; November 1931. ABSTRACT: The theoretical principles involved in the design are discussed and it is shown that the results obtained are in accordance with these principles.... Everything is explained in terms of the currents and charges on the feeder, which can be definitely specified. The misuse of the idea of the potential of the earth had been responsible for the argument that the system cannot eliminate the horizontal component, and for this reason it is not considered valid. (a-1, b-1, c-1, d-5, e-0, f-Theory)

679. DAVIS, G. L., "Design and Calibration of Vibrating-Reed Indicators," Bureau of Standards, Journ. of Research, vol. 7, pp. 1166-1170, July 1931. ABSTRACT: The paper gives a general treatment of the theory of design of vibrating reed indicators developed in connection with work on the tuned-reed course indicator for the air-craft radio-range beacon. The equations and conclusions may be readily adapted to apply to any similar vibrating system. The theory is strictly applicable only when the vibrations are so small that the square of their amplitude may be neglected in comparison with the square of the air-gap. As a result of the analysis of large vibrations of tuning forks by Mallet, the behaviour of the reed at relatively large amplitudes of vibration is inferred, although an exact quantitative treatment and verification of the theory is difficult. Design equations are given for uniform reeds and for the type used in the indicator. From the results of both theory and experiment the effect of the various factors of design and operation upon the reed frequency is discussed, and the calibration procedure necessary to take account of these factors is outlined. (a-3, b-1, c-1, d-1, e-0, f-Theory)

680. DUNMORE, F. W., "Pointer Instrument for Equi-Signal Beacon," Bureau of Standards, Journ. of Research, vol. 7, pp. 147-170 July 1931. ABSTRACT: In this device, known as a reed converter, the motion of the two reeds generates small alternating voltages which, when rectified by copper-oxide rectifiers and passed in opposing directions through a zero-centre indicating instrument, serve to give course indications by the deflection of the indicating instrument needle in the direction of the deviation of the aeroplane from the course. Since a null method of course indication is used it is necessary to provide a signal volume indicator in the form of a 0-500 microammeter in the output circuit of the oxide rectifiers. Since the course sharpness indications depend upon the signal level delivered to the instrument, this sharpness may be controlled at will. The advantages of this reed converter as compared to the tuned reed indicator are discussed. (a-3, b-1, c-1 d-1, e-0 f-Description)

681. FOSTER, R. M., "Mutual Impedance of Earth Wires Lying on the Surface of the Earth," Bell System Techn. J., vol 10, pp. 408-419; July 1931. ABSTRACT: This paper presents a formula for the mutual impedance between two insulated wires of negligible diameter lying on the surface of the earth and earthed at their end-points. The formula holds for frequencies which are not too high to allow all displacement currents to be neglected. For any two elements dS, ds of the two wires the mutual impedance is obtained from their d. c. mutual impedance by introducing the complex factor $(2\gamma r)^{-2}[1-(1+\gamma r)\, e^{-\gamma r}]$ in the reactance term, γ being the propagation constant in the earth, and r the distance between the elements dS and ds. (a-1, b-1, c-1, d-1, e-0, f-Theory)

682. HINMAN, W. S., "Automatic Volume Control for Aircraft Radio Receivers," Bureau of Standards, Journ. of Research, vol. 7, pp. 37-46; July 1931. ABSTRACT: The device described, which can easily be applied to existing sets, is primarily for use in the reception of the visual-type radio-range beacon signals. It operates on the output voltage of radio receiver, and is equipped with a filter unit to prevent operation on signals other than those from the beacon. The audio output is rectified by a copper-oxide rectifier, smoothed by a condenser and resistance network, and the resulting voltage is applied as negative bias to the radio-frequency amplifier. The device is said to maintain practically constant output conditions for an input voltage range of 5000 to 1. (a-3, b-1, c-1, d-1, e-0, f-Description)

683. STERBA, E. J., "Theoretical and Practical Aspects of Directional Transmitting Systems," Proc. IRE, vol. 19, pp. 1184-1215; July 1931. ABSTRACT: This paper discusses some of the more important principles involved in the development of the directional transmitting aerials at present employed in the Bell System short-wave facilities. The theoretical performance of directive arrays is presented by means of various curves which have been obtained by integrations based upon Poynting's theorem. The details of the mathematical derivations are omitted for the sake of brevity, but the general procedure and the resulting formulae have been placed in an Appendix. Various practical problems encountered in the development are described. These include tuning procedure, transmission-line adjustments, and sleet melting facilities. (a-1, b-1, c-1, d-1, e-0, f-Theory)

684. WISE, W. H., "Effect of Ground Permeability on Ground Return Circuits," The Bell System Techn. Journ., vol. 10, pp. 472-484; July 1931. ABSTRACT: The formulas for the self and mutual impedances of ground return circuits are derived without restricting the ground permeability. Curves are given to show the effect of a ground permeability 1.7 on the mutual impedance between two parallel ground return circuits with the wires lying on the ground. (a-1, b-1, c-1, d-1, e-0, f-Theory)

685. BRUCE, E., "Developments in Short-Wave Directive Aerials," Proc. IRE, vol. 19, pp. 1406-1433; August 1931. ABSTRACT: In Part I of this paper is discussed the relative importance of the factors which limit the intelligibility of short-wave radio telephone communication. The more important of these factors are inherent set noise, external noise (static, etc.), and signal fading. The possibility of counteracting these limitations through aerial directivity is indicated. In Part II an aerial system is described which maintains a desirable degree of directivity throughout a broad continuous range of frequencies. The cost of this aerial is more favourable than that of many types of fixed-frequency aerials of equal effectiveness. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

686. BESSON, P., "System of Radio Beacons," Onde Elec., vol. 10, No. 117, pp. 369-425; September 1931. ABSTRACT NO. 1: An early article on the A-N type of beacon. The range and precision of the system, and various types of antenna system are discussed. Results of tests of experimental apparatus are given. ABSTRACT NO. 2: In this article the author is concerned with the type of adio beacon which lays down a definite course to be followed by a ship or aeroplane and in particular with the crossed-coil or interlocking type widely used in America under the description equi-signal beacon. The author has developed a type of interlocked beam by using for the transmitting aerial system a coil and open aerial in combination. In the simple case of interlocked letters A and N, the A is transmitted when the coil is associated with the aerial in a given phase, the N being transmitted with the coil and aerial associated with a phase difference of π. In both cases the polar diagram is of the cardioid form, but they are as it were mirror images of one another. Thus two interlocking fields are obtained as in the case of the more widely used crossed-coil system The stability of the course and ease of adjustment are said to be superior to that of other systems. A description is given of full scale experiments at La Pallice. The maximum power in the coil was about 250 and in the aerial 5 watts, and with very simple receiving equipment the signals were still strong at a range of 18 km. In one particular test the area of equal signals was only 10 m wide at a range of 12 km; this width is of course dependent on the ratio of the power in the coil to that in the aerial. Mention is made of the possible use of the system for rotating radio beacons, and also for the definition of sectors. In the Discussion, C. Bourgonnier referred to experiments which he carried out on a similar system and pointed out that the superior accuracy claimed for Besson's method over the crossed-coil method is only due to the very short ranges employed in Besson's experiments and that in point of fact the two systems are practically equal for short distances, while the crossed-coil system is superior at long range; E. Fromy mentioned experiments carried out to determine the best conditions for the easiest recognition of the separate letters in the A and N or F and L interlocked system; the experiments were made under laboratory conditions and dealt with such problems as intensity of sound, type of keying, modulation ratio, etc. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Descriptive analysis)

687. BLAIR, W. R., AND LEWIS, H. M., "Radio Tracking of Meteorological Balloons," Proc. IRE, vol. 19, p. 1531; September 1931. ABSTRACT: There is a need for upper air meteorological observation at night as well as in the daytime, in cloudy and in foggy weather as well as in clear. This need has given rise to a number of interesting methods of obtaining these data, among them radio tracking of meteorological balloons. A free balloon moves in the air current prevailing at the level it occupies. A small rubber balloon, six inches or less in diameter, when inflated with hydrogen to a given excess lift will rise at a given ascensional rate to great heights. Successive determinations of the position of one of these pilot balloons provides ready means for computing the mean direction and speed of the wind in the layer of air through which the balloon has risen during the interval between determinations of position. On clear days these balloons have been followed by visual methods to heights of 20 miles. This paper deals with a radio method of determining successive balloon positions. A light transmitter, weighing about a pound, is carried up by the balloon at a known ascensional rate. Loop receivers are employed in ranging for this transmitter. The whole project involves the determination of air temperature aloft as well as air movement but the work on it so far has been limited to the development of equipment needed for the observation of wind, direction, and speed. Positions are usually determined at minute intervals. Tables and equipment employed in the reduction of data are made to fit this interval. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

688. NAISMITH, R., "Position Location at Sea," Journ. Sci. Inst. London, vol. 8 pp. 279-282; September 1931. ABSTRACT: The object of the present article is to describe an instrument which provides a graphic record of the distance and bearing of the ship from a fixed point. The instrument is designed to record, automatically, the absolute intensity of the field-strength from a rotating radio beacon transmitter of the type described by Smith-Rose and Thomas. (a-1, b-1, c-1, d-5, e-0, f-Description)

689. SMITH-ROSE, R. L., AND PETRIE, J. S., "The Attenuation of Ultra-Short Waves Due to the Resistance of the Earth: and an Experimental Direction Finder for Use on Ultra-Short Waves," Proc. Phys. Soc., vol. 43, pp. 592-610. See also: Disc., pp. 611-612; September 1931. ABSTRACT: An investigation was made of the attenuation of waves between 5 m and 10 m when transmitted directly along the earth's surface. Field-intensity measurements were carried out at both Slough and Teddington by means of the audio-frequency voltage across the telephones of a simple two-valve loop receiver. Transmitter distances up to 700 m were used. Qualitative observations were also made at distances up to 20 miles with a single-loop direction-finder. It was found that the signal intensity on such short wave-lengths depends largely upon the existence of obstacles in the path of transmission. The signal-intensity at a distance of 20 miles over a direct air line was of the same order as that at 4 miles for transmission along the ground. Comparing the experimental results with those calculated from a simple wave-attenuation theory, it is found that the value of the conductivity of the earth appears to lie between 5×10^8 and 30×10^8 esu for the frequencies used. The most suitable value of the dielectric constant is about 10, but the experimental method does not enable this to be determined very accurately. (a-3, b-1, c-1, d-5, e-0 f-Description)

690. DAVID, P., "Recent Progress in Radio Direction Finding for Ships and Aircraft," Revue Industrielle, vol. 61, nos. 2266 and 2267, pp. 512-517; September 1931, pp. 584-589; October 1931. ABSTRACT: Use of radiogoniometry on airplanes; fixed radiogoniometric network on ground; rotating and fixed direction finding transmitters; radio beacons. (a-3, b-2, c-3, d-3, e-0, f-Radiogoniometers)

691. SCHWANDT, E., "Direction-Finding for Aviation, Especially for the Luft-Hansa Line," Funk U. Ton; October 1931. ABSTRACT: Not available. (a-4, b-0, c-4, d-4, e-0, f-0)

692. SERRE, E., "Radio Direction-Finding Applied to Airlines," Onde Elec., vol. 10, pp. 425-457, 514-520; October, November 1931. See also Electrician, vol. 4, p 67; February 1932. ABSTRACT NO. 1: Principles of a radio network for air navigation. Polarization errors and night-effects. Principles of Adcock systems. Different systems are proposed to decrease the polarization error two loops differentially connected and in the same plane will have a pattern with a null in the vertical direction and will differentiate between vertical and horizontal propagation; with a modification of this system using two loops in the same plane differentially connected and symmetrical with respect to a 45° line, one of the loops can be moved up and down; one can eliminate all reflections. ABSTRACT NO. 2: This paper describes the experiences of the Compagnie Générale Aéropostale in the radio operation of their route between Paris and the Brazilian coast. The general aspect of radio direction-finding as an aid to aircraft navigation is first discussed, after which some of the difficulties of working under tropical conditions are enumerated and the troubles due to night effect described at some length. The Adcock system is then briefly described, and the following points quoted against it: size, cost, susceptibility to atmospherics due to the use of open aerials, and finally "its complete failure to avoid errors due to a vertical field arriving in a direction which has been deviated with respect to the vertical plane joining transmitter and direction-finder." A system has been developed which is claimed to be an improvement over the Adcock in many of these points, and consists in its simplest form of two frames in the same vertical plane, equidistant from the ground and connected in opposition. This eliminates fields arriving in a vertical direction, but does not eliminate night effect due to fields at an incidence of 45 degrees, or even less if the vertical component is considerable. To eliminate such fields the frames must be symmetrical with respect to a plane making an angle of 45 degrees with the horizontal. A combination of the two-coil systems then gives a system which is practically free from all troubles due to reflected fields. There is some description of methods for improving the sharpness of minimum, and an account is given of actual results obtained in the course of flights between Casablanca and Cap Juby. (a -6, a_2-3, b-1, c-3, d-3, e-0, f-Description and analysis)

693. SMITH-ROSE, R. L., AND Hatcher, E. L., "New Wireless Compass," Wireless World, vol. 29, pp. 410-412; October 1931. See also Wireless Engineer, vol. 9, p. 39; 1932. ABSTRACT: An automatic D/F system using a rotating cardioid pattern obtained from a motor-driven loop and a vertical sense antenna is described. The indicator is a magnetic device similar to a galvanometer, but has an electromagnetic (which rotates synchronously with the loop), instead of the permanent magnet of the ordinary galvanometer. The equipment was a product of Material Telephonique (Paris) and was intended for marine use. (a-6, b-1, c-1, d-5, e-0, f-Description)

694. ANONYMOUS, "A Note on the Theory of Night Errors in Adcock D/F Systems," Admiralty Signal Establishment (British); Report No. M. 278; November 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

695. ANONYMOUS, "Description of International Marine Radio

Company Direction Finder, Type RC-1A," Army Air Force, Report No. MID 2280-A-1113; 12 November 1931. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

696. BELLINI, E., "The Correction of Radio Direction Finders for Deviation Due to Metallic Mass of Ship," Bull. S. F. R. Ser. 5, vol. 1, p. 1249; December 1931. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

697. KRUGER, H., AND PLENDL, H., "Polarization Fading," Zeits. f. Techn. Phys., vol. 12, pp. 673-678; December 1931. See also Onde Elec., vol. 11, p. 5A, 1931. ABSTRACT NO. 1: Fading might result from a rotation of the polarization planes as shown by two successive transmissions on crossed horizontal dipoles, two receivers being connected separately to such antennas. The use of two crossed dipoles might help to decrease the fading action. ABSTRACT NO. 2: By means of a specially constructed transmitter and receiver operating on a wave-length of 53 m, the time-variation of the received beam reflection at the zenith was investigated. Variations in the plane of polarization up to 20 per minute could be investigated. The experiments showed good agreement with those of Pedersen and of Breit. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Experiment)

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698. BAKER, W. G., AND GREEN, A. L., "The Influences of the Earth's Magnetic Field on the Polarization of Sky Waves and Its Bearing on Direction-Finding Errors," Austral. Radio Res. Board, Report No. 3, pp. 9-34; 1932. See also Wireless Engineer, vol. 10, p. 396; July 1933. ABSTRACT NO. 1: Discussion of the possible effects on bearing due to different polarization intensity and direction as shown by maps of polarization condition. ABSTRACT NO. 2: The paper, which is mathematical, opens with a reference to previous work by various other authors. It shows that it is possible by making certain reasonable assumptions to calculate the polarisation of downcoming waves propagated at any given angle to the earth's magnetic field. Maps are given showing the results of such calculations applied to the station 2BL at Sydney. In an Appendix calculations are given showing what effect collisions between electrons and gas molecules have on the relative absorptions of the ordinary and extraordinary rays. (a_1-6, a_2-3, b-1, c-1, d-11, e-0, f-Mathematical analysis)

699. BELLINI, E., "Closed Adjustable Ring Above or Below Direction-Finder Frame, to Increase Reception from Directions Adversely Affected by Neighbouring Conductors," German Pat. 583,488 Pub. 4.9. ABSTRACT: Not available. (a-4, b-8, c-4, d-4, e-0, f-Description)

700. DIECKMANN, M., "Recording of Night Effect," (German: E. N. T.) See: Air Document Index No. R2464 F 1173; 1932. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-0)

701. HERMANSPANN, P., "On the Bearing Breadth in Direction Finder Receivers," Telefunken Zeit, vol. 13, pp. 35-36; 1932. See also Exper. Wireless, vol. 9, p. 528; 1932. ABSTRACT: The dependence of bearing breadth on signal strength and background noise level is discussed. The minimum breadth is given by the angle ϕ determined by the points of intersection of the double-circle diagram and the background noise circle. By taking the subtending arc to be a straight line, the angle ϕ is found from tan

$$\frac{\phi}{2} = \frac{H}{N}\sqrt{\frac{H^2}{N^2} - 1},$$

where H is field strength of signal, and N is that of noise. A figure giving the observed minimum breadth of a Telefunken equipment on 1000 meters is shown. (a-6, b-1, c-4, d-4, e-0, f-Analysis)

702. LEUTHERITZ, H. C., "Radio Communication on the International (Pan American) Air Lines," Radio Eng., vol. 12, p. 25; 1932. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

703. MESNY, R., "Radio Direction-Finding," Congres. Int. d'Elec. Paris, Report No. 10, sec. 9, p. 13; 1932. See also Science Abstracts, vol. 36, p. 67; 1933. ABSTRACT: The author explains the principles of D/F systems of the following types: the Bellini-Tosi system, the small loop type, and a direct-reading system using a cathode-ray oscillograph. The peculiarities of their use on board ships and aircraft are discussed, and the accuracy that may be expected is given. Night errors and their causes and elimination are examined. The best way to choose a site for a D/F is indicated. The paper concludes with a description of radio beacons i.e., rotating-loop and crossed-loop types. (a-6, b-1, c-3, d-3, e-0, f-Descriptive analysis. Note: Title may read, "La Radiogoniometre)

704. VICE-DOMINI, F., "Le Deviazioni Radiogoniometriche a Bordo," Regia Academia Navale Livorno n 70, 8 pages; 1932. ABSTRACT: Radio direction finding on board ships; principles; compensation of deviation. (a-3, b-3, c-9, d-9, e-0, f-Description)

705. WACHTLER, M., "New Experiences in the Compensation of Wireless Direction Finders in Ships," Hansa Deutsche Schiff. No. 38; 1932. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

706. DARBORD, R., "Ultra-Short-Wave Reflectors and Transmission Lines," Onde Elec., vol. 11, pp. 53-82; January 1932. ABSTRACT NO. 1: The article describes the 18 cm communication system between Calais and Douvres. Huygen's principle is applied to the study of parabolic and spherical reflectors. Properties of transmission lines used to build wave-meters and matching networks are discussed. A mathematical derivation of parabolic reflector formulas from Huygen's and conservation of energy principles is given. An appendix on transmission line theory is included. ABSTRACT NO. 2: In this paper the principle of Huygens is applied to a determination of the optimum arrangement of reflectors for waves of the order of 18 cm. Even though a reflector having an aperture of 3 m is used, the ordinary optical laws cannot be applied, since this corresponds to an aperture of some 15 wave-lengths only, and it is accordingly necessary to take account of diffraction effects. It is found that the efficiency of a parabolic reflector is a maximum when the focus is situated in the plane of the aperture. In this case the gain due to the reflector is the ratio of the half perimeter of the reflector to the wave-length. The use of transmission lines on these very short waves enables the output impedance of the oscillating valve to be matched to the aerial system, and, further, an application of the same principle admits of the design of a precision wavemeter. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description. Note: Science Abst. dates Publication as February 1932)

707. DAVIES, G. L., AND ORTON, W. H., "Graphical Determination of Polar Patterns of Directional Antenna Systems," Bureau of Standards Journal of Res., vol. 8, p. 555; January 1932. ABSTRACT: This paper describes graphical methods for the determination of polar patterns of directional antenna systems. These methods are less tedious and more generally applicable than computation from available mathematical equations. At any distant point, the relative phases of the disturbances from the individual antennas of an array are dependent upon the differences in the paths from the antennas to the point, and upon the relative phases of the antenna currents. The path differences may be readily constructed on a scale drawing of the array, and by means of a special protractor these path differences are converted to phase angles for the construction of a vector diagram representing the disturbances at the field point. The resultant of this vector diagram gives the field intensity at that point. Such diagrams for a number of points equidistant from the array give the relative field intensities in various directions and thus enable a polar pattern to be drawn. As illustrations, the polar patterns of two very simple arrays are determined; a broadside array of two antennas spaced one-half wave-length and carrying equal equiphased currents; and an end-on array of two antennas spaced one-quarter wave-length and carrying equal currents in time quadrature. By a principle for the addition of the directive patterns of groups of antennas, the work involved in determining patterns of arrays containing a large number of antennas may be greatly simplified. This method also permits ground effects to be readily included, the image current being calculated by means of equations given by Wilmotte. (a-1, b-1, c-1, d-1, e-0, f-Description)

708. ANONYMOUS, "Radio Receiving Equipment, a Part of Navy Model GK-1 Equipment," U.S. Navy, Bureau of Engineers, Instruction Book No. 5672. See also Department of Commerce PB 38107; February 1932. ABSTRACT: The GK-1 equipment described in this manual consist of four receivers, a frequency indicator and accessories and is intended for use on large rigid type airships and to operate from direct current supply available on these ships. The receiving equipment fulfills three major functions as follows: (1) Ordinary communication simultaneously in two channels within the frequency band of 15 to 30,000 kc by the use of two independent receivers: (2) weather forecasts may be received on an independent receiver covering the frequency band of 300 to 22,000 kc: (3) direction finding facilities in the frequency band of 100 to 1000 kilocycles are afforded by the fourth receiver operating with a loop. Photographs, diagrams, drawings and a parts list are included in this book. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

709. CAPILLA, A., "Montaje y empleo de los radiógoniometros a bordo de los buques," Revista General de Marina, vol. 110, no. 2, pp. 179-201; February 1932. ABSTRACT: Installation and use of radiogoniometers on ships; numerical examples with data on calibration. (a-3, b-3, c-9, d-9, e-0, f-Description)

710. DIAMOND, H., AND DAVIES, G. L., "Characteristics of Airplane Antennas for Radio Range Beacon Reception," Proc. IRE, vol. 20, No. 2, pp. 346-358; February 1932. ABSTRACT: Results of investigation on characteristics of airplane receiving antennas to determine whether antenna arrangement could be devised which would have all desirable electrical properties of vertical-pole antenna and yet be free from mechanical difficulties encountered in use of pole antenna. (a-3, b-1, c-1, d-1, e-0, f-Study report)

711. DIECKMANN, M., "Directional Records of Night Effect," E. N. T., vol. 9, pp. 44-48, February 1932. See also Wireless Engineer, vol. 9, p. 287; May 1932. ABSTRACT NO. 1: This report shows that on distant stations working on wave lengths of the order of 1635 meters, the practically uniform record given by an Adcock antenna system is similar to the records given by rotating loops. One might point out the similarity of shape and timing of the latter two records whose receivers are spaced less than one-tenth wave length. Where the spacing is increased to one wave length, the curves still show considerable resemblance in shape, but display at certain points displacements in time up to one minute, and still more if the spacing is increased. As the spacing is increased, the similarity in shape decreases until at about 25 km none remains. These displacements in time are not constant. ABSTRACT NO. 2: Simultaneous directional records were obtained of the transmission from a station operating on a wave-length of about 1500 m at from 2 to 4 receiving stations whose distance apart varied from zero up to 25 km. The results throughout confirm the results of Eckersley, Adcock and others. When the distance apart of the different directional receivers is not greater than about one-tenth of the wave-length (λ), the records taken on one and the same transmitter are very similar and exhibit practically simultaneous variations. If the distance apart of the receiving stations is increased to λ, the resulting records, though still to a certain extent similar, show time displacements for points of marked change of as much as a minute and this time difference is increased the further the stations are separated. On still further increasing the separation of the character of the records becomes more and more different until at 25 km (for a wave-length of about 1500 m) no similarity of the records can be seen at all. The time displacements observed at shorter distances are by no means constant. At 7 km distance the intervals varied from 6 minutes to zero and back again. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Experiment)

712. RUPRECHT, H., "The Natural Electromagnetic Oscillation of a Rod-Shaped Conductor at the Surface of Separation of 2 Media with Different Dielectric Constants," Hochf: tech. u. Elek: akus., vol. 39, pp. 59-66; February 1932. See also Wireless Engineer, vol. 9, p. 287; May 1932. ABSTRACT: In addition to the errors due to metallic parts of the ship, it is possible for the ship's hull as a whole to resonate at the signal frequency insofar as the electromagnetic field has a horizontal electrical component. The hull is at the surface of separation of media having different dielectric constants; and the length of a hull which would cause resonance with a given wave length depends on the draught. The present paper investigates this relation both theoretically and experimentally, the complex hull being represented for simplicity by a cylinder of circular section of nonferromagnetic material (brass); centimeter waves were used for the tests. Resonance may occur if the length of the ship lies between 1/2 and 1/18 of the received wave-lengths. (a-6, b-1, c-4, d-4, e-0, f-Theory and experiment)

713. SOLT, C. T., "The Development and Application of Marine Radio Direction-Finding Equipment by the U.S. Coast Guard," Proc. IRE, vol. 20, pp. 228-260; February 1932. ABSTRACT NO. 1: The paper presents a resume of the results obtained with modern (1932) equipment under actual conditions encountered in military use. The various problems dealt with in the evolution, development, and practical applications of radio direction-finding equipment by the U.S. Coast Guard are discussed. ABSTRACT NO. 2: This paper presents a résumé of the results obtained with modern equipment under actual service use and refers to the problems arising in connection with the development and application of radio direction-finding equipment by the United States Coast Guard. The type of equipment employed is described; it is used on vessels varying from 75 ft motor boats to cutters having a displacement of 3000 tons. In addition, an equipment has been designed and is in use on aircraft; a description of this and the results obtained are also included. The deviation characteristics of various types of vessels are described, and some discussion of the variation of deviation with frequency is given. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Description)

714. SWENY, L. A., "Radio Aids to Air Navigation," Wireless World, vol. 30, pp. 192-195; February 1932. ABSTRACT: The article describes non-technically the use of the Bellini-Tosi and Marconi-Adcock direction finders for air navigation in Europe. It concludes that the Adcock system is best and has less error due to night effect. Beacon systems in U.S.A. and Britain are described. (a-6, b-1, c-1, d-5, e-0, f-Description and evaluation)

715. BOURGONNIER, C., AND DUREPAIRE, M., "Receiving Loop Antennas for Low-Frequency Alternating Magnetic Fields," Rev. Gen. d'Elec., vol. 31, pp. 403-410; March 1932. See also Science Abstracts, vol. 35, p. 470; 1932. ABSTRACT: The object of this paper is to develop the principles to be followed to obtain the optimum design for a tuned coil to be used as a pick up in connection with a leader cable system. No generalization is given, but it is shown that the coil with the greatest number of turns under given conditions is not necessarily the best. Further, the bigger the ratio of the impedance of the tuned coil to the number of turns the better the coil. Experiments are described showing that the theory developed agrees with practical data. (a-6, b-1, c-3, d-3, e-0, f-Theory)

716. SMITH-ROSE, R. L., AND HATCHER, E. L., "Direction Finder Type D. F. G. 9A," Marconi Rev., no. 35, pp. 22-27; March-April 1932. See also Wireless Engineer, vol. 9, p. 410; July 1932. ABSTRACT: Designed primarily for use with a small shielded loop, this equipment uses the aperiodic Bellini-Tosi system and gives a sharply-defined zero. It uses auxiliary antenna for balancing and sense. Four ranges covering frequencies from 75 kc - 1 mc are provided. (a-6, b-1, c-1, d-5, e-0, f-Description)

717. SCHWERIN, P., "Electronic Direction Finder," Electronics, vol. 4-5, p. 111; March 1932. ABSTRACT: The article is a brief excerpt of a patent. A vacuum tube with an anode and two auxiliary electrodes, arranged so that, by means of four pieces of high magnetic permeability and low permanent magnetism, the earth's magnetic field will draw electrons to one or the other of the electrodes. (a-6, b-2, c-1, d-1, e-0, f-Description)

718. McDONALD, J. A., "Wireless Direction-Finding as Aid to Air Navigation," Roy. Air Force Quarterly, vol. 3, no. 2, pp. 220-231; April 1932. ABSTRACT: Fundamental principles and merits of various systems in process of development; explains and compares these systems without much technical detail. (a-3, b-2, c-1, d-5, e-0, f-Evaluation report)

719. PALMER, L. S., "Short-Wave Reception on Tuned Rectangular-Frame Aerials," Proc. Roy. Soc., vol. 136, pp. 193-209; May 1932. See also Science Abstracts, vol. 35, p. 619; 1932. ABSTRACT: The wave is considered to cause a frame current which can be resolved into a "direct" current component due to the primary action of the wave and an indirect current component, due to the field of the current in the adjacent parts of the frame. This leads to the conclusion that the resultant current is dependent on the dimension of the frame, on the wave length and on the angle of incidence of the wave. A phase lead due to the width of the frame may be annulled by an equal phase lag due to the height of the frame. (a-6, b-1, c-1, d-5, e-0, f-Theory)

720. ANONYMOUS, "Installing and Operating Instructions, Radio Direction Finder Model DN," USN, BeEngr. See Dept. Comm. PB L17413; June 1932. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instruction)

721. FOSTER, R. M., "Geometrical Circuits of Electrical Networks," AIEE, Trans., 51, pp. 309-317; Disc; 321-328; June 1932. ABSTRACT: If all the electrical properties are abstracted from a given electrical network, there remains a geometrical circuit, completely characterised by the sets of branches terminating at the various vertices. In this paper enumerations of geometrical circuits are given, classified according to two different parameters, the nullity (number of branches minus number of vertices plus number of separate parts) and the rank (number of vertices minus number of separate parts). There is also a partial list of geometrical circuits which are symmetrical with respect to all the branches and all the vertices. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

722. MILLER, J. E., "New Organisation of Radio Beacon and Radio Direction-Finding Services," Journal des Telecommunications, vol. 56, p. 165; June 1932. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

723. STARR, A. T., "The Non-Uniform Transmission Line," Proc. IRE, vol. 20, no. 6, p. 1052; June 1932. ABSTRACT: The problem of transmission of periodic waves along a transmission line, whose series impedance and shunt admittance per unit length vary as any powers of the distance from some point, is solved. The solution is given in terms of Bessel functions. A length of such a line is considered as a four-terminal network, and the more important parameters of the network are given. From these parameters one derives immediately the attenuation of current and voltage along the line. The solution is given for a line consisting of a number of parts, each of which is of the form described above. The line constants (so-called) need not vary continuously from one part to the next. The results can be applied to the cases of a tapered submarine cable, an overhead line with a pronounced sag, and end effects in a high tension line (a-1, b-1, c-1, d-1, e-0, f-Theory)

724. BUREAU, R., "Direction-Finding Researches on Atmospherics," Comptes Rendus, vol. 194, pp. 2073-2074; 6 June 1932. ABSTRACT: Reports the results of studies on the incidence and direction of atmospherics made with a modified form of an apparatus already described using a frequency of 27 kc per second. During the night, two sources were observed nearly at right angles to one another, one nearly north and south and the other nearly east and west. The various phases show a marked regularity: between sunset and midnight the north-south series predominate, and from midnight to sunrise the east-west series are more important, while about midnight both series are present. In the afternoon both series were observed. These results are in general agreement with those of Schindelhauer. (a-3, b-1, c-3, d-3, e-0, f-Description)

725. DUELL, B., "Radio Direction-Finding Experiments with Aurora," Funk u. Ton, Berlin; 10 June 1932. See also Electrician, vol. 4, p. 268; August 1932. ABSTRACT: The experiments describe bearings taken at short time intervals (30 seconds) at Stockholm. Signal strengths were also recorded. These were in relation to observations of the visible aurora occurring at the time of the experiments. (a-4, b-1, c-4, d-4, e-0, f-Description)

726. DAVIS, N. E., "The Performance of the Marconi-Adcock Direction-Finder," Marconi Revue, no. 37, pp. 17-21; July, August 1932. See also Wireless Engineer, vol. 9, p. 588; October 1932. ABSTRACT: Operational data on subject direction finder showing that only 1.2% of night errors are greater than 3° compared with 63.8° for the Bellini-Tosi type. Further the equipment is usable all of the time except for very short periods, easily discernible by the equipment's indication. (a-6, b-1, c-1, d-5, e-0, f-Evaluation of equipment)

727. PHILLIPS, C. G., "Navigation by Wireless," Wireless World, vol. 31, p. 26; July 1932. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

728. DUELL, B., "The Cause of Night Errors in Direction-Finding," ENT, vol. 9, pp. 308-18; August 1932. See also Wireless Engineer, vol. 9, p. 643; November 1932. ABSTRACT NO. 1: The writer's observations, combined with material derived from geophysical and astronomical observations, lead to the conclusion that there is a close connection between sunspots, terrestrial magnetic disturbances and aurora on the one hand and the irregular bearing variations occurring during twilight and night on the other hand. The writer gives his theory according to which a complete explanation of the observed phenomena is found in the sudden "electroinvasion" (due to increased solar activity) of the earth's atmosphere by electrons, alpha-particles, and photo-electrically-excited metallic and ash molecules. The beginning of the invasion caused marked inhomogeneities in the Kennelly-Heaviside layer which produce violent fluctuations in refraction, polarization and absorption. ABSTRACT NO. 2: Describes experiments to determine relations between the fading of wireless waves and factors such as the position of the sun, magnetic storms, etc. Observations were made on several German transmitters having wave-lengths ranging from 472.4 m to 1411.8 m during the period October 1930 to March 1931. The results are given in the form of curves, showing, for example, the HF field-intensity and sunspot activity on the same curve. A marked correspondence between auroral activity and wireless variations is indicated. The relation between fading and solar position appears to vary with the time of the year. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Theory)

729. KEAR, F. G., AND WINTERMUTE, G. H., "Simultaneous Radio Telephone and Visual Range Beacon for Airways," Bureau of Standards, J. of Research, vol. 7, pp. 261-287; August 1932. ABSTRACT: The transmitter consists of a 2-kw radio telephone operating into a non-directional aerial system and an additional set of amplifier branches supplying power through a goniometer into two loop aerials. The loop aerials are symmetrically arranged, and coupling effects are balanced out to prevent distortion of the space-pattern. The phase of the currents in the different aerial systems is controlled by a phase-shifting unit. (a-3, b-1, c-1, d-1, e-0, f-Description)

730. PALMER, L. S., AND HONEYBALL, L. L. K., "The Action of Short-Wave Frame Aerials," Proc. IRE, vol. 20, pp. 1345-1367; August 1932. ABSTRACT: The theory of the action (see Abstract No. 719) is discussed in Part I; the experimental investigation is described in Part II. The transmitter, which is capable of working on wave-lengths from 7.54 to 8.80 m, is described, and the chief difficulties in its design are discussed. The frame is capable of expanding or contracting in either or both dimensions, the maximum size being about 8.5 m square. Measurements are described which enable the direction of wave propagation to be made parallel to the plane of the frame. Preliminary measurements are made to study the nature of the polarisation and the inclination of the electric vector of the wave. The results of a series of measurements of the critical frame dimensions are recorded, and are compared with data predicted from the theory. (a-3, b-1, c-1, d-1, e-0, f-Descriptive theory)

731. FOSTER, R. M., "Mutual Impedance of Earthed Wires Above the Earth," Physical Review, vol. 41, pp. 536-537; 15 August 1932. ABSTRACT: A formula already established for the mutual impedance between any earthed thin wires lying on the surface of the earth is now extended to include wires lying in horizontal planes above the surface and earthed by vertical wires at their four end-points. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

732. COALES, J. F., "Theory of Night Errors in Adcock Direction-Finding Systems," JIEE, vol. 71, pp. 497-506; September 1932. See also Science Abstracts, vol. 36, p. 67, 1933. ABSTRACT: The paper deals with the theory of night errors (i.e., those errors which cannot be estimated owing to their variation from minute to minute and their dependence on factors not easily determined) in wireless D/F systems. Expressions are described for the errors which may be obtained as a result of the presence of both ground and atmospheric waves. The fixed Adcock system is shown to be less liable to errors than loop systems, but there are substantial zones in which, for certain conditions of the atmospheric or indirect ray from a transmitter, the fixed Adcock is subject to blurred minima and to bearing errors. These zones increase with increase of space between aerials, and maximum error occurs when the intensity of the ground and atmospheric waves are approximately equal. The rotating Adcock system is shown to be free from blurred minima and errors due to night effect. (a-6, b-1, c-1, d-5, e-868, f-D/F errors)

733. TSUKADA, T., "Improved Goniometer-Type Direction Finder for High-Frequency Waves," Rep. of Rad. Res. in Japan, vol. 2, p. 8; September 1932. See also Wireless Engineer, vol. 10, p. 102; 1933. ABSTRACT: A type of goniometer having a divided search coil is described. The rotating search coil is divided into two parts, on a common shaft, but at right angles to each other. The two parts are electrically connected in series. There are two antenna coils, each within its shielded chamber, and each coupled to one part of the search coil. Stray coupling between the two antenna coils is thus entirely eliminated, with a resulting improvement in the operation of the system at high frequencies. Two Adcock-type antennas, at right angles to each other, are used. (a-6, b-1, c-6, d-6, e-0, f-Description)

734. KRAMAR, E., "New Developments in Radio Beacons," Hochf: tech. u. Elek:akus, vol. 40, pp. 88-92; Sept. 1932. See also Wireless Engineer, vol. 9, p. 642; November 1932. ABSTRACT NO. 1: Three new types of visual indicator are described. The first is a "magnetic-bias" keying method using two iron-cored chokes, one of which is operated in a saturated condition, to produce the complementary member of a pair of interlocking signals, when keyed by one member of the pair. The second method uses a succession of "dots" and a complementary succession of "dashes" to key the signals from the two loops. The third method uses the dots and dashes also, but in a differential circuit. The paper concludes with a discussion of the use of ultra-short waves for beacons. ABSTRACT NO. 2: An historical sketch of systems of automatic direction indicators for aircraft, including the latest American improvements and the adoption of ultra-short waves. A new method of keying is shown to improve the sensitivity of the system for locating the range; a modified visual indicator is also described. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

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735. MUNRO, G. H., AND HUXLEY, .. G. H., "Shipboard Observations with a Cathode-Ray Direction Finder Equipment," JIEE, vol 71, pp. 488-496; Sept. 1932. See also Science Abstracts, vol. 36, p. 67; 1933. ABSTRACT: The paper describes the temporary installation of a kathode-ray direction finder on board a ship and observations on long-wave stations and atmospherics during a voyage from Port Said to Brisbane. The quadrantal error due to the ship was obtained by comparing the calculated bearing of various long-wave stations with those observed on the kathode-ray direction-finder. This curve was then used to correct the observations which were systematically made on atmospherics. The results of these observations suggested a source in Central Africa as the predominant one during most of the voyage, though round the coast of Australia the northern interior of that continent was found to contain the majority of the sources. (a-3, b-1, c-1, d-5, e-0, f-Description)

736. HARDY, R., AND BERTRAND-LFPAUTE, "Direct Reading Stroboscopic Radio Direction Finder," Comptes Rendus, vol. 195, pp. 518-524; 5 September 1932. See also Wireless Engineer, vol. 9, p. 642; November 1932. ABSTRACT NO. 1: The authors describe a new type of visual indicator for use with a direction finder of the rotating-loop and sense antenna type. The receiver is adjusted so that saturation occurs when there is any appreciable output from the antenna system. The output of the detector then consists of alternate long and short pulses separated by narrow "chasms" which are caused by the nulls in pattern of the antenna system. These "chasms" are used to produce high voltage pulses (150 v) which light neon tubes in a stroboscopic indicator. ABSTRACT NO. 2: The instrument consists of two frames mounted at right angles, and made to rotate at about 600 rpm, the output being amplified considerably by a valve amplifier. The HF current from a suitable, adjustable aerial is superimposed on that from the frames, and the output of the amplifier passes through a neon lamp, which can be observed through a slit in a disc running synchronously with the frame aerial. The amplifier is so adjusted that, except when the input current from the rotating aerial is zero, saturation occurs, and no variations of the neon lamp are to be observed. When the adjustable aerial is correctly set, the current is low, saturation no longer occurs, and the neon lamp suddenly shows an approximately sinusoidal wave-form. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

737. MILLER, J. E., "Radio Guidance," Proc. IRE, vol. 20, pp. 1752-1762; November 1932. ABSTRACT: The system described employs two rotating radio beacons transmitting simultaneously and on the same frequency. A radio receiver carried aboard the craft to be guided received the combined transmission from the two beacons. Special equipment for this receiver's output takes bearings from the two beacons and fixes the position of the craft by trangulation, the position being indicated by intersecting light beams thrown upon the under surface of a map. The operation is continuous and, after the necessary initial adjustment, is also automatic as long as the craft remains within effective range of the beacons. Guidance may be obtained at any point within the useful range of the beacons, and there is no limit to the number of routes and of planes served simultaneously. (a-3, b-1, c-1, d-1, e-0, f-Description)

738. FRANCK, P., "Radio in Aircraft Navigation," Onde Elec., vol. 11, pp. 542-552; December 1932. ABSTRACT: Summary of the work done in radio aerial navigation from 1922 to 1932. (a-6, b-1, c-3, d-3, e-0, f-Survey)

739. JANSKY, K. G., "Directional Studies of Atmospherics at High Frequencies," Proc. IRE, vol. 20, pp. 1920-1932; December 1932. ABSTRACT: A system for recording the direction of arrival and intensity of atmospherics on short waves consists of a rotating directional aerial array, a double detection receiver and an energy operated automatic recorder. The operation of the system is such that the output of the receiver is kept constant regardless of the intensity of the atmospherics. Data obtained with this apparatus show three separate groups of atmospherics: (1) from local thunderstorms; (2) from distant thunderstorms; (3) a steady hiss type of unknown origin. Curves are given showing the direction of arrival and intensity of atmospherics of the first group plotted against time and for several different thunderstorms. The second group was found to correspond to that on long waves in the direction of arrival and is heard only when the long-wave atmospherics are very strong. The direction of arrival of group (3) varies gradually throughout the day, going almost completely round the compass in 24 hours. It seems probable that this type is in some way associated with the sun. (a-3, b-1, c-1, d-1, e-0, f-Description)

740. KRAMAR, E., "Ultra-Short Wave Wireless Beacon," E.N.T. vol. 9, pp. 469-473; December, 1932. ABSTRACT: Experiments are described with a short-wave beacon system operating on a wavelength of about 7 m. The generator was controlled by a tourmaline crystal and had a telephony power of about 2 watts; its range under normal conditions was about 4 or 5 km and the breadth of the beam was about 2° to 3° when reflectors were arranged one on either side of the transmitting aerial. (a-3, b-1, c-4, d-4, e-0, f-Experiment)

741. ANONYMOUS, "Phase Synchronization for TL-Antenna System," Air Commerce Bul.- Aeronautics Branch, vol. 4, no. 11, pp. 260-4; 1 December 1932. ABSTRACT: For angle of 2° change in capacity of 1.2 mmf could readily be carried by effect of rain or snow; therefore, means of control of this phase must be provided by suitable design of transmission-line system which excites individual antennas; theoretical analysis. (a-3, b-3, c-1, d-1, e-0, f-Theoretical analysis)

742. ANONYMOUS, "Wireless Equipment for African Aircraft," Engineer, vol. 154 no. 4012, p. 570; 2 December 1932. ABSTRACT: First four Atalanta-type aircraft for Cairo-Capetown air route are provided with Marconi apparatus; sets comprise combined transmitter and receiver covering wavelength ranges of 40 to 80 and 500 to 1000 m; both telephone and telegraph communication can be maintained on each wave band; Marconi-Robinson directional receiving equipment provided for giving simple direction-finding service. (a-3, b-2, c-1, d-5, e-0, f-Description)

743. BEAUVAIS, G. A., "Study of Total Reflection of Radio Waves," Comptes Rendus, vol. 195, pp. 1068-1070; 5 December 1932. See also Onde Elec., vol. 12, pp. 161-179, 213-235, 273-294; April, May, June 1933. ABSTRACT NO. 1: Theory and description of the required apparatus to measure the electric field of 20 cm wave. The apparatus is called a "Radiometer". Study of refraction for a vertically and horizontally polarized wave. Theoretical study of the refraction index of a wax prism. ABSTRACT NO. 2: Hertzian waves falling perpendicularly on one side of an isosceles right-angled triangular prism of paraffin (n = 1.46 for the waves used, λ = 18 cm), totally reflected from the hypotenuse, and passing out by the other side should give rise to an evanescent wave behind the hypotenuse of intensity decreasing exponentially with the distance therefrom. Such a wave was observed by means of the author's radiometer by measuring the series of maxima and minima occurring when the radiometer was moved parallel to, and at various distances behind, the hypotenuse, the successive maxima for different distances decreasing in accord with theory. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Analysis and theory)

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744. DIAMOND, H., "Fading Elimination by Rotating Polarization of Directed Beam: Rotating Frequency Lower than Oscillating Frequency: Simultaneous 'Direction Wobble'," Hochf: Tech. u. Elek: akus, vol. 42, p. 74; 1933. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

745. DIECKMANN, M., AND BERNDORFER, F., "Circuit of Direct-Reading Direction Finder," Hochf: Tech. u. Elek: akus, vol. 41, p. 35; 1933. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

746. ENDE, W., AND GLOECKNER, M. H., "Direct-Reading Direction Finder," Electrical Communications, vol. 11, p. 113; 1933. ABSTRACT: Not available. (a-4, b-2, c-1, d-1 e-0, f-0)

747. ENDE, W., AND GLOECKNER, M. H., "The Cathode-Ray Compass," Zeits. f. Flugtechnik. u. Motorluft., vol. 23, p. 603; 1933. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

748. FASSBENDER, H., "Yearly Report of the Electrical Engineering and Radio Division of the German Aircraft Research Establishment (D.V.L.)," ETZ, vol. 54, p. 885; 1933. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

749. HARDY, R., "A New Stroboscopic Direction Finder," Hochfreq. u. Elektro., vol. 42, p. 35; 1933. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

750. HELL, R., "Direction Finder Working on Audible Indicating Maximum," Hochf: tech. u. Elek: akus, vol. 42, p. 148; 1933. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

751. KEAR, F. G., "The Elimination of Night-Course Variations in Radio Range Beacons," Trans. Amer. Geophys. Union, 13th Meeting, p. 154, 1933. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

752. LISTER, J., "Automatic Steering Control with Automatic Radio Drift Correction for Aircraft," Gen. Elect. Rev., vol. 36, p. 15; 1933. ABSTRACT: Not available. (a-4, b-3, c-8, d-0, e-0, f-0)

753. LISTER, J., "Developments in the Electrical Industry During 1932," Gen. Elect. Rev., vol. 36, p. 7; 1933; ABSTRACT: Not available. (a-4, b-1, c-8, d-0, e-0, f-0)

754. DIAMOND, H., "The Cause and Elimination of Night Effects in Radio Range Beacon Reception," Bureau of Standards J. of Research vol. 10, pp. 7-34; January 1933. ABSTRACT: A new aerial system is described for use at direction-finding beacon stations which eliminates the troublesome night effects. Because of the magnitude of these effects, particularly in mountainous country the direction-finding beacon course often becomes of no value beyond about 30 miles from the beacon station. With the new transmission-line aerial system, the beacon course is satisfactory throughout its entire distance range, the night effects becoming negligible. Comparative experimental data are given between transmission-line and loop aerial systems under nearly identical conditions. An analysis shows that the night effects are produced by horizontally polarised components in the sky wave which are radiated from the horizontal elements of the loop transmitting aerials. The transmission-line aerial system employs four vertical aerials placed on the corners of a square; two of the aerials on the diagonal corners replacing one of the loop aerials of the present range-beacon stations, while the other two replace the other loop aerials. The arrangement employed differs in important particulars from those previously used (e.g. in England), and is the result of trial of a number of expedients. (a-1, b-1, c-1, d-1, e-0, f-Description)

755. HARDY, R., "Direction-Finding and Stroboscopic Direction Finders," Rev. Gen. d'El., vol. 33, pp. 85-94; 21 January 1933. ABSTRACT: In a previous paper, Hardy and Lepaute described the operations of a stroboscopic radio compass having a rotating frame aerial together with a fixed aerial, with a stroboscopic indicator of the neon-lamp type. The present paper gives practical details of this system, used in conjunction with single-loop aerials and those comprising two loops at right angles. Several types are described, differing somewhat in detail, suitable for various purposes such as marine and aeroplane use. Automatic indicators which give the required bearing directly are described. (a-3, b-1, c-3, d-3, e-0, f-Description)

756. BERTIN, C., "The Precision Attained by a Goniometric Loop and the Convenience of the 'Radio-Line'," Comptes Rendus, vol. 196, p. 913; March, 1933. See also Wireless Engineer, vol. 10, p. 396; July 1933. ABSTRACT: I recommend as the geometrical locus of a craft, which takes a bearing on a coast station of known coordinates, the "radio-line" which passes as a distance (from the calculated positions of the craft) given by the vector $\Delta Z \tan M$, where M is the distance of the craft from the station and ΔZ the discrepancy between the bearing taken on board and the bearing calculated by dead-reckoning. The "radio-line" is itself inclined to the meridian at the angle $Z \pm g \sin \phi_M$, g being the displacement in longitude and ϕ_M the mean latitude. This angle is also the angle at which the station would place the craft. (a-1, b-1, c-3, d-3, e-0, f-Analysis)

757. HOLLINGWORTH, J., "Some Characteristics of Short-Wave Propagation," JIEE, vol. 72, pp. 229-248; Discussion 249-251; March 1933. ABSTRACT: In Part I of the paper is given a description of the phenomena observed when using a kathode-ray direction-finder on closed coils for examining received signals on frequencies of the order of 10,000 kc. The two outstanding features are the systematic appearance of certain cyclic forms, and the large values obtained for the horizontally polarised electric components. The former are then examined in the light of the magnetoionic theory, and it is shown that the majority of them admit of simple explanation on this basis. The latter are chiefly of interest in raising the question of the angle of incidence, which appears to be much less than is generally supposed; and Part II is devoted to a more detailed examination of the question. (a-1, b-1, c-1, d-5, e-0, f-Description)

758. MARCOTTE, E., "La signalisation optique et hertzienne dans l'aéronautique," Arts et Métiers, no. 151, pp. 124-9, April 1933. ABSTRACT: Optical and radio wave signaling in aeronautics; description of modern practice; radio beacons; radio-electric signals; directional cables; radio directional finding; short-wave beacons; organization of direction finding system in France (a-3, b-2, c-3, d-3, e-0, f-Description)

759. TSUKADA, T., "Wireless Direction-Finding: Marconi-Adcock System," Electrician, vol. 110, p. 513; April 1933. ABSTRACT: The Marconi-Adcock installation consisting of four vertical antennas in a square with a receiver and a goniometer at the center is described. The "lead-in" system is a grounded-outer-conductor coaxial line, which reduces pick up of horizontally polarized signals. Models are produced which operate on frequencies up to 30 mc. (a-6, b-1, c-1, d-5, e-0, f-Description)

760. ANONYMOUS, "Direction-finding at Night," Elec. Rev., vol. 12, no. 2892, p. 594; 28 April 1933. See also Elecn., vol. 110, no. 2864, p. 513; 21 April 1933. ABSTRACT: Limitations of direction finding inherent in design of normal type of equipment; description of Pulham installation. (a-3, b-1, c-1, d-5, e-0, f-Evaluation)

761. ANONYMOUS, "Model DO-2 Radio Direction Finder Equipment, A.C. Operated - Range: 100 - 1500 KC. Instructions," USN, BuEngr. See Department of Commerce PB LC17439; May 1933. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

762. GREEN, C. F., AND BECKER, H. I., "Radio Aids to Air Navigation," Elect. Engineering, vol. 52, pp. 307-313; May 1933. ABSTRACT: The device described is a direction finder employing a loop and fixed vertical aerial, the emf's from them being combined and passed through a receiver. In order to obtain a visual indication showing when the loop is in the off-zero position and to which side of the zero it is displaced, the loop output is modulated with an audio-frequency of asymmetrical wave-form such as would be obtained by combining a second harmonic with its fundamental. This gives a wave-form with a high peak on one side. According as the loop is on one or other side of the zero position its output adds to or subtracts from that of the aerial. The effective audio-modulation of the radio-frequency wave entering the receiver thus depends for its wave-form (i.e., high peak or low peak) on whether the loop output adds or subtracts from the aerial output. There is connected across the telephone output of the receiver a non-linear resistance in series with a dc indicating instrument, thus indicating which of the two wave-forms is present in the output and hence which side of the zero the loop is deflected. The combination of a direction finder of this type with an inductor compass and gyro turn-compensator to enable a direct course to be steered towards any transmitter, even under conditions of cross wind, is also described. (a-3, b-1, c-1, d-1, e-0, f-Description)

763. SMITH-ROSE, R. L., "The Electrical Properties of Soil for Alternating Currents at Radio Frequencies," Proc. Roy. Soc., vol. 140, pp. 359-377; 3 May 1933. ABSTRACT: The application of a laboratory method for measuring the conductivity and dielectric constant of samples of soil taken from selected sites at the National Physical Laboratory, Teddington, is described. These measurements were made over a range of frequencies of from 1000 cycles per second to 10 million cycles per second, and for various moisture contents ranging from practically zero up to a value exceeding that normally experienced for surface soil taken direct from the ground. The results of these measurements show that the conductivity varies from less than 10^5 esu for dry soil, up to a value of approximately 10^8 esu for normal moisture content. Corresponding values for the dielectric constant range from 2 or 3 for dry soil up to about 20 for moist soil at high radio frequencies. The results of measurements made on a number of samples of soil taken at random from several other sites are included in the paper, and show that both the normal moisture content and the conductivity can have values which are appreciably higher than those experienced at Teddington. The paper concludes with a brief discussion of the penetration of radio-frequency currents in the earth, and the effective depth of penetration has been calculated in some instances with the aid of the experimental values of conductivity and dielectric constant determined above. (a-3, b-1, c-1, d-5, e-0, f-Qualitative analysis)

764. BUREAU, R., "Rapid Variation of Atmospherics at Sunrise," Comptes Rendus, vol. 196, pp. 1426-1428; May 1933. ABSTRACT: The application of Lugeon's theory regarding the source of atmospherics at sunrise leads to values for the height of the ionisation layer which are too low since it was thought necessary to wait until the sun's rays were in the zenith at the receiving station. Using curves for Paris, Tunis and Rabat in this way an ionisation layer was found at 15-20 km. The time of decrease of the curve of atmospherics depends, however, on the number of reflections between the ionised layer and the ground

as well as on the height of the layer. These views have been confirmed by observations at St. Cyr. There were also found many sources of atmospherics at the end of the night between the directions south and west which disappeared successively from south to west in about 45 min. If solar action were at the zenith above the receiver all should disappear together. Also, when the morning fall is in a series of steps the sources are to be sought in different azimuths. Thus the curves of atmospherics appear to give a localisation of distant sources rather than a method for determining the height of the ionised layer. (a-3, b-1, c-3, d-3, e-0, f-Experimentation)

765. RATCLIFF, J. A., AND PAWSEY, J. L., "A Study of the Intensity Variations of Downcoming Wireless Waves," Proc. Cambridge Phil. Soc.," vol. 29, pp. 301-318; 10 May 1933. ABSTRACT NO. 1: Report of experiments made to measure lateral deviation and fading of radio waves. Mention is made of the diversity effect in reception of radio waves. ABSTRACT NO. 2: The paper describes experiments made on wave-length between 200 and 500 m at distances from the transmitters of 56 and 200 km. The normal and abnormal components of the downcoming waves were investigated by means of the suppressed ground-ray system; a simple form of direction-finder on the Adcock principle was also used to investigate the lateral deviation. A further system consisting of two loops at right angles combined with an open aerial was used to investigate the polarisation of the downcoming ray. The results obtained are described and some typical records are shown. The probable causes of intensity variation are discussed in the light of the data acquired, and it is suggested that a major cause of "fading" is the interference at the ground of waves "scattered" from a series of diffracting centres distributed over an area of radius at least 20 km in the present experiments. The possible results of such a mechanism are discussed. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Analysis and experiment)

766. ANONYMOUS, "Model DO Radio Direction Finder Equipment D.C. Operated - Range 100-1500 KC," Radio Corporation of America: Instruction Book IB23262; 24 May 1933. See also Department of Commerce PB17441. ABSTRACT: These instructions cover the installation, operation and servicing of the Model DO Radio Direction Finder Equipment. This equipment is of the 115 volt, d-c, line-operated superheterodyne type and covers the frequency range of 100 to 1500 kilocycles, and when properly installed and calibrated will accurately indicate the direction of propagation of pure or modulated continuous wave signals (either keyed or unkeyed) at any frequency in this band. The design of the equipments supplied on this contract (Models DO, DO-1, DO-2, and DO-3) are modifications of the Model DO. Interchangeability of major assembly units between models is shown in table form. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

767. ANONYMOUS, "Model DO-1 Radio Direction Finder Equipment A.C. Operated - Range: 100-150 K.C.," RCA Victor Company, Inc., Camden, New Jersey, Instruction Book IB23263, 24 May 1933. See also Department of Commerce PB17440. ABSTRACT: These instructions cover the installation, operation and servicing of the Model DO-1 Radio Direction Finder Equipment. This equipment is of the 115 volt, a-c, 60-cycle, line operated, super heterodyne type and covers the frequency range of 100 to 1500 kilocycles, and when properly installed and calibrated will accurately indicate the direction of propagation of pure or modulated continuous wave signals (either keyed or unkeyed) at any frequency in this band. The design of the equipments supplied on this contract (Models DO, DO-1, DO-2, and DO-3) are modifications of the Model DO. A table shows the major units of each equipment and the interchangeability of the various items furnished on this contract. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

768. CHINN, H. A., "A Radio-Range Beacon Free from Night Effect," Proc. IRE, vol. 21, pp. 802-807; June 1933. ABSTRACT: A radio range beacon is described which is suitable for the guidance of aircraft along established airways and is entirely free from atmospheric variations of "night effects." Advantage is taken of the phenomenon that waves of frequencies higher than 30 megacycles per sec, or thereabouts, are not usually refracted back to the earth by the Kennelly-Heaviside layer. Multiple path transmission, variation in signal intensity and in polarisation are thus avoided. A four-course aural beacon operating on 34.6 megacyles per sec was employed for the experimental work. Results and applications are discussed. (a-1, b-1, c-1, d-1, e-0, f-Description)

769. DIAMOND, H., "On the Solution of the Problem of Night Effects with the Radio Range Beacon System," Proc. IRE, vol. 21, no. 6, p. 808; June 1933. ABSTRACT: A new antenna system is described for use at radio range beacon stations which eliminates the troublesome night effects hitherto experienced in the use of the range beacon system. Considerable data, comprising ground and flight measurements, are given on both aural and visual type range beacons using the present loop transmitting antennas, which show the severity of the night effects encountered. Because of the magnitude of these effects, particularly in mountainous country, the range beacon course often becomes of no value beyond about thirty miles from the beacon station. With the new antenna system developed, referred to as the transmission-line antenna system, the beacon course is satisfactory through its entire distance range, the night effects becoming negligible. Experimental data are given comparing the performance of the transmission-line and loop antenna systems under nearly identical conditions. The paper includes a theoretical analysis of the phenomena underlying the occurrence of night effects and how to eliminate them. (a-1, b-1, c-1, d-1, e-0, f-Description)

770. FELDMAN, C. B., "The Optical Behavior of the Ground for Short Radio Waves," Proc. IRE, vol. 21, no. 6, pp. 764-801; June 1933. ABSTRACT: The role of the ground in radio transmission is first considered generally. In short wave propagation taking place via the Kennelly-Heaviside layer, only the ground in the vicinity of the antennas is involved, and its effect may be included in antenna directivity. The utility of so ascribing the ground effect exclusively to the terminals of a radio circuit rests on the applicability of simple wave reflection theory in which the distance between the terminals does not appear. For this purpose, reflection equations similar to Fresnel's equations for a nonconducting dielectric are employed with a complex index of refraction. The paper describes experiments undertaken to determine the limit of applicability of these opt[illegible] reflection equations and discusses the results. Particular emphasis is placed on the identification of direct and reflected waves. The existence of a surface wave, foreign to simple reflection theory, is recognized with vertical antennas, when the incident wave is not sufficiently plane. At angles of incidence between grazing and the pseudo-Brewster value the requirements of planeness are severe. The relation of optics to Sommerfeld's theory is discussed. The experiments include tests made with the aid of an airplane. For short wave communication via the Kennelly-Heaviside layer, use of the modified Fresnel equations is shown to be justified. These equations fail only at substantially grazing incidence and then merge into the Sommerfeld ground wave solution. The ground effect is always to discriminate against radiation or reception at very low angles. Two methods of determining the electrical constants of the ground are described. One comprises measurements of the elliptical polarization of the ground wave, and is based on Sommerfeld's propagation theory. The other is a method of measuring at radio frequencies the conductivity and dielectric constant of samples of ground removed from the natural state. Suitable agreement between the two methods is found if the nonuniformity and stratification of natural ground is considered. The sample method is also used to determine the conductivity of ocean water. (a-1, b-1, c-1, d-1, e-0, f-Descriptive-theory and analysis)

771. NAKAI, T., "Field Strength Measurements and Directional Observations of High-Frequency Radio Waves at the Electrotechnical Laboratory, Ministry of Communications, III," Rep. of Rad. Research in Japan, vol. 3, pp. 89-98; June 1933. See also Engin. Index, p. 903; 1933. ABSTRACT: Measuring apparatus was designed and set up at Electrotechnical Laboratory, Ministry of Communications, in Tokyo. A vertical antenna was employed in the measurements. Calibration of the overall gain of the vertical antenna and its tuning circuit was made by comparing it with a loop, taking into consideration the effect of wave absorption due to surrounding objects. (a-6, b-1, c-6, d-6, e-0, f-Description)

772. KEAR, F. G., "Synchronisation in Directive Aerial Arrays," Bureau of Standards J. of Research, vol. 11, pp. 123-139; July 1933. ABSTRACT: With the development of the TL aerial system for use with the radio range beacon a new problem was encountered. It became necessary to provide a positive means of stabilising the space pattern. Slight detuning of the aerials would alter the course indications. The extent to which detuning affects the pattern is demonstrated in detail, and the limits to which the tuning must be maintained are shown to be very rigid. To overcome this difficulty two types of excitation systems have been developed in which the stability of the space pattern is independent of the aerial tuning to a marked degree. Either a parallel connected pair of lines 90° in electrical length or a series connection of lines 180° in length is shown to possess this characteristic. Experimental data on several types of lines show the system to be practical for use along the airways, and no sacrifice of the desirable features of the TL aerial is required. Tests of the system on actual airway range beacons show it to be satisfactory. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

773. ECKERSLEY, T. L., "Experimental and Theoretical Study of

the Polar Distribution of Energy in a Beam at Great Distance from the Sender," Marconi Review, vol. 43, pp. 1-11; July-August 1933. ABSTRACT: The question of difference between theoretical and observed values of energy concentration from beam aerial array as revealed by recent experiments made by Marconi Company in conjunction with British Post Office on transmission from Marconi Beam station at Kilipheuval, South Africa. (a-3, b-1, c-1, d-5, e-0, f-Experiment)

774. BAKER, W. G., AND GREEN, A. L., "Limiting Polarisation of Downcoming Waves Traveling Obliquely to the Earth's Magnetic Field," Proc. IRE, vol. 21, pp. 1103-1131; August 1933. ABSTRACT: The paper, which is entirely theoretical, reaches the following main conclusions: (a) the polarisation of the downcoming wave tends to a definite limit on leaving the Heaviside layer; (b) the shape of the ellipse of polarisation is determined by the ratio of the wave frequency to the critical frequency and by the angle between the direction of propagation and the lines of force of the earth's magnetic field; (c) the orientation of the ellipse is such that the principal axes are perpendicular to the direction of propagation; the major axis is in the plane containing the direction of propagation and the direction of the earth's magnetic field; (d) the sense of rotation of the electric vector is left-handed when the direction of propagation of the ordinary ray makes an acute angle with the earth's field, right-handed when the angle is obtuse; (e) it has been shown possible by suitable transformations to predict the polarisation of downcoming rays for any given distance and for any given direction from the transmitter; (f) it is pointed out that in the Kennelly-Heaviside layer the true direction of propagation is oblique to the wave-front. Practically this suggests that a wave propagated obliquely to the earth's field would be laterally deviated, the amount of deflection depending on the gradient of ionisation in the layer; (g) the relative attenuations of the "ordinary" and "extraordinary" rays have been plotted for oblique propagation to the earth's field assuming simple conditions. (a-3, b-1, c-1, d-1, e-0, f-Theory)

775. GLOECKNER, M. H., "Errors in Direction Finding with Loop Aerials," (German: D.V.L.) See: Department of Commerce PB54-595; August 1933. ABSTRACT: During the night as well as at dawn and dusk, incorrect beams were signaled to aircraft. The errors occur if the plane of polarization of the incoming waves is swiveled through more than 90 degrees to the right or left from their normal position and if the sky wave predominates at the same time. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Analysis)

776. KRAMER, E., "Radio Direction Finder for Use on Airplanes," Bureau of Standards Techn. News Bull., no. 194, p. 83; August 1933. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

777. BELLINI, "Erreurs dans la détermination de la courbe d'érreurs quadrantale d'un radiogoniomètre de bord dues à la forme l'antenne d'émission," Société Française des Electriciens - Bul., vol. 3, no. 33; pp. 882-884; September 1933. ABSTRACT: Analysis of article by J. F. Coales, indexed in Engineering Index 1932, p. 385 from Instn. Elec. Engrs.- J.; September 1932; errors in determination of quadratic error curves of ship radio compass due to form of emission aerial; errors studied on radio compass of Bellini-Tosi type, installed between two chimneys of light cruiser of 4400 tons. (a-3, b-1, c-3, d-3, e-0, f-Analysis)

778. DUNMORE, F. W., "Radio Beacon Quadrant Identification," Bureau of Standards J. of Research, vol. 11, pp. 309-325; September 1933. ABSTRACT: Certain circumstances may arise, especially when near the radio beacon, when a pilot may pass from one course or quadrant to another without his knowledge of it. When once so lost, he may wander many miles in an attempt to reorient himself, since the four courses are all practically identical, and two of the four quadrants between the courses give identical indications. This paper describes a method of obviating this difficulty by transmitting a directive signal composed of one dot in a westerly direction, a similar signal of two dots in an easterly direction, three dots north, and four dots south. Depending upon which set of these signals is the loudest, a pilot may determine his general direction from the beacon. Methods of transmitting these signals with practically no interruption to the visual beacon signals and during the station identification interruption of the aural beacon are described. The change from the figure-of-eight transmission for the courses to the unidirectional cardioid transmission may be accomplished either by changing the point of coupling into suitable phasing sections in the transmission line feeding the aerial or by superimposing on a figure-of-eight radiation through a suitable hybrid coil circular radiation in phase with the figure-of-eight radiation. Standard relays operated by a motor-driven dot-sending device serve to make these changes. In the latter method a simple reversing relay serves to reverse the direction of transmission of the cardioid signals in a given set of aerial systems. (a-1, b-1, c-1, d-1, e-0, f-Description)

779. HORTON, C. E., AND CRAMPTON, C., "A Radio Compass Developed in H. M. Signal School," JIEE, vol. 73, pp. 284-292; Disc. 292-294; September 1933. See also Wireless Engineer, vol. 10, pp. 434-436; August 1933. ABSTRACT: The customary direction-finding procedure is to make use of the figure-of-eight characteristic for taking the direction, the resolution of the ambiguity being the subject of a separate operation usually involving the use of the cardioid characteristic. The direction finder developed by the authors is a combination of the figure-of-eight reception with the cardioid under conditions which ensure: (1) that the minimum of the cardioid is coincident in direction with the zero of the figure-of-eight; (2) that the cardioid is in quadrature with that of the figure-of-eight. The procedure adopted is to superimpose upon the figure-of-eight a small cardioid which thus blurs the reciprocal bearing leaving the true bearing unaffected. Since only a small cardioid is needed it need not be absolutely perfect and the fact that it is in quadrature with the figure-of-eight means that the zero of this latter cannot be shifted by the superposition of this cardioid. If the main figure-of-eight is obtained from a rotating coil, the cardioid is conveniently obtained from a coil at right angles rotating with it, and associated with a stationary open aerial. A theoretical discussion is then given of the performance of the equipment on a ship, certain correcting devices are referred to, and, finally, the installation and sea trials of the equipment are described. (a-3, b-1, c-1, d-5, e-0, f-Description)

780. COALES, J. F., "Errors in Direction-Finding Calibrations in Steel Ships Due to the Shape and Orientation of the Aerial of the Transmitting Station," JIEE, vol. 73, no. 441, pp. 280-283; September 1933. See also Wireless Engineer, vol. 10, pp. 434-436; August 1933. ABSTRACT NO. 1: In this paper it is shown that, owing to the effect of the ship on the incoming wave, a vertical magnetic field may, through re-radiation, cause errors in the observed bearing taken with a wireless direction-finder. Experiments show that in the case of calibrations carried out with a roof aerial, if the receiving ship is not in line with the roof, errors of 1° or 2° may arise if the roof is not symmetrical. The error, however, decreases rapidly with increasing distance from the transmitter, and also with increasing frequency. The expressions for these errors are then derived mathematically and it is shown that they are closely allied to the ordinary deviation due to "ship effect." The error should be most marked in the direction of the electric axis of the ship (that in which the deviation is zero, usually the fore-and-aft line) and nonexistent at right angles to this. The work was carried out in a light cruiser with one of H. M. destroyers as transmitting ship, and this paper has been prepared in H. M. Signal School. ABSTRACT NO. 2: Considers the problem stated in title with particular reference to frequencies up to one mc and shows that if the antenna of the transmitting ship radiates a horizontal component, the error produced will be appreciable for short distances between the D/F and the transmitter. The effect is practically unnoticeable for distances of over 20 wavelengths. Error also decreases with increasing frequency. The error is produced by the ship acting as a loop capable of receiving horizontal waves, and then reradiating the energy for pickup by the D/F loop. (a_1-4, a_2-6, b-1, c-1, d-5, e-0, f-Descriptive analysis)

781. BOEHM, O., "Anti-Fading Aerials for Broadcasting," Hochf: tech. u. Elek: akus. vol. 42, pp. 137-145, October 1933. ABSTRACT: The author points out that diminution of fading due to downcoming waves interfering with the groundwave is minimised at a given distance by radiating power from aerials at low angles only. To achieve short-wave directivity in the vertical plane without appreciable directivity in the horizontal plane, two 2-wire feeders are hung at the ends of a cross-arm at the top of a mast. Horizontal radiators, forming a square, are attached to the feeders at the correct positions, all carrying current in phase. For long-waves, a disc aerial having elevated horizontal resonating wires radiating from a central point, a cylindrical aerial having vertical resonators in a circle and a vertical linear radiator with a current node at the centre are described. Records indicating reduction of fading at a distance with the use if improved aerial systems are given. (a-3, b-1, c-4, d-4, e-0, f-Descriptive analysis)

782. DIAMOND, H., "Performance Test of Radio Systems of Landing Aids," Bureau of Standards J. of Research, vol. 11, pp. 463-490; October 1933. ABSTRACT: The system is comprised essentially of three elements giving the aircraft knowledge of its position in the three dimensions: (1) the runway beacon, functioning like a radio range beacon on a smaller scale, enables it to aim at the airport and keep over the landing runway; (2) the landing beam guides it along a specified gliding path till it touches ground accurately on the aero-

drome; (3) the marker beacons signal the aircraft's crossing of two boundaries in approaching the aerodrome. Further, an approximate indication of distance from the landing ground is obtained from the runway beacon, being operated by the A.V.C. on the runway beacon reciver. If (1) fails, approximate location is obtained from the radio range beacons and approximate orientation from the compass. The directional effect in receiving the landing beam permits more accurate orientation of the aircraft along the landing runway. If (2) fails, the marker beacon and the "zero signal zone" over the runway beacon tell the pilot the limits of the landing ground. He can then fly away a known distance and height (using the distance indications as a check) and return along a suitable gliding path. If (3) fails, the distance indicator and altimeter permit him to reduce speed on approaching the ground. This ability of the system to function with any two elements alone yields an effective margin of reliability. The present paper describes specially the application of the system in practice, including development of the aircraft receiving equipment; and flight tests, including hooded landings with three and with only two of the elements of the system in action. (a-3, b-1, c-1, d-1, e-0, f-Description)

783. JANSKY, K. G., "Electrical Disturbances Apparently of Extra-Terrestrial Origin," Proc. IRE, vol. 21, pp. 1387-1398; October 1933. ABSTRACT: Electromagnetic waves of an unknown origin were detected during a series of experiments on atmospherics at high frequencies. The data obtained from the directional records taken of these waves for a period of over a year show that the horizontal component of the direction of arrival changes approximately 360° in about 24 hours in a manner that is accounted for by the daily rotation of the earth. Further, the rotation of the earth about the sun accounts for the manner in which the time at which these waves are a maximum and the direction from which they come at that time change gradually throughout the year. These facts lead to the conclusion that the direction of arrival of these waves is fixed in space: i.e., they come from some source outside the solar system. Although the right ascension of this source can be determined from the data with considerable accuracy, the error not being greater than ±7.5°, the limitations of the apparatus and the errors that might be caused by the ionised layers of the earth's atmosphere and the attenuation of the waves in passing over the surface of the earth are such that the declination of the source can be determined only approximately. Thus the value obtained might be in error by as much as ±30°. The data give for the coordinates of the region from which the waves seem to come a right ascension of 18 hours and a declination of -10°. (a-1, b-1, c-1, d-1, e-0, f-Theory)

784. MIOCHE, "Radio Beacons for Aerial Navigation," Anna les des P.T.T., vol. 22, pp. 841-873; October 1933. ABSTRACT NO. 1: A general discussion of aerial navigation using fixed and rotating beacon systems; advantages and limitations of each system are given. ABSTRACT NO. 2: The author first considers radio beacons with fixed fields and discusses the 4-course beacon of the Bureau of Standards, the system of the Société d'Éntreprises Électrotechniques and the 12-course system of the Bureau of Standards. In the section dealing with radio beacons with rotating fields the systems of the Société Française Radioélectrique and of Loth are described. Interference-field methods are also dealt with. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Analysis)

785. GREENLEAF, S. A., "Examination and Test of RCA Victor Company CXC H.F. Direction Finder, Serial No. 2," USN, NRL Report No. R-1001; 19 October 1933. See also Department of Commerce PB122729. ABSTRACT: CXC Direction Finder; Radio Direction Finders (HF); Radio Direction Finders-Tests. (a-3, b-3, c-1, d-1, e-0, f-Test)

786. KRUESI, G. G., "Design, Fabrication, and Test of Automatic and Manually Operated Ground Direction Finders," Army Air Force, Wright Field, Dayton, Ohio, 31 October 1933. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

787. BURGESS, W. B., "Compact Direction Finders for Atmospheric Disturbances," Proc. IRE, vol. 21, p. 1518; November 1933. ABSTRACT NO. 1: This is an abstract of a paper presented before the IRE, Washington Section. The author presented first a summary of methods used in the directional study of atmospherics. A compact D/F was described for 12 kc. ABSTRACT NO. 2: "Compact Direction Finders for Atmospheric Disturbances" was the subject of a paper by W. B. Burgess of the U.S. Naval Research Laboratories. The author presented first a summary of methods previously used in the directional study of atmospherics emphasizing that when multiple sources are involved, integrating devices are less satisfactory than taking bearings on the individual crashes. A compact direction finder was described. It employes a cathode ray tube and a receiver unit having fixed loops of small dimensions. It is operated on a fixed frequency of 12 kc and requires a field intensity of 8 mc per meter per centimeter of deflection of the cathode ray at maximum intensity. By comparison with the output of a local calibrated oscillator and attenuator, field strengths are readily computable up to about one volt per meter. Bearings uncalibrated with respect to intensity may be taken on atmospherics of much greater field strength. Tests indicate an inherent instrumental accuracy of direction of two degrees. The problems of shielding of circuits and the substantial elimination of regenerative effects were discussed. Iron shields were found necessary and the voltage gain of the amplifier was approximately nine million. The apparatus is being used by the U. S. Navy in the study of atmospherics and meteorological conditions. (a_1-6, a_2-2, b-1, c-1, d-1, e-0, f-Description)

788. DE BLAVOUS, P. V., "The Position at Sea by Radio Goniometric Bearings Taken on Board," Hydrographic Revue, vol. 10, pp. 87-109; November 1933. ABSTRACT: A complete discussion of the mathematics of position-finding from true bearings over a long distance. (a-6, b-1, c-1, d-0, e-0, f-Analysis)

789. KRAMAR, E., "Blind Landing of Aircraft," E.N.T., vol. 10, pp. 451-453; November 1933. ABSTRACT: The original radio beacon system of landing aims at guiding the aeroplane along a line of equal intensity of the ultra hf field from the ground station. The line of normal intensity is sharply inclined to the horizontal at the point whence landing is commenced, and approaches the ground tangentially. Under certain conditions, the maximum safe gliding angle may be exceeded at the commencement of the descent or, near its completion, the necessary height to clear neighboring obstacles may be too quickly lost. It is better to choose a gliding path along which the selected field-intensity gradually increases with time according to a fixed law, e.g. linearly. Descent commences at 2/3rds normal intensity and variation of speed and initial height are of much less consequence. (a-3, b-1, c-4, d-4, e-0, f-Analysis)

790. KRAMAR, E., "New Field for Ultra-Short Waves," Proc. IRE, vol. 21, pp. 1519-1531; November 1933. ABSTRACT: Some time ago A. Esau and W. M. Hahnemann referred to the applications of ultra-short waves and to their suitability for a precise bundling of radiation. In the meantime, other authors have discussed the same subject. The present paper describes the use of this kind of waves in connection with radio beacons. A new method of forming a guide ray by keying the reflectors is stated. The dependence of the guide ray upon size, spacing, and number of reflectors is measured. There is no distortion due to reflections. A description is given of the use of the radio range beacon for blind landing of aeroplanes in thick weather. Simultaneous visual and aural reception in the aeroplane is possible without changing the method of keying the transmitter. (a-1, b-1, c-1, d-1, e-0 f-Analysis)

791. PLENDL, H., "Polarization Measurements for the Investigation of Night Errors in Radio-Direction-Finding," Zeits. f. tech. Physik., vol. 14, pp. 518-522; November 1933. See also Wireless Engineer, vol. 11, p. 96; 1934. ABSTRACT NO. 1: Description of D.V.L. investigation at 178 meters with 10 km between transmitter and receiver. To decrease the effects of ground-wave, the transmitting antenna was a horizontal dipole oriented at right angles to the unbalanced receiving antenna. Night and twilight-errors were observed up to 90°. The phase variations are due to three types of change: (1) the rapid and slight change of the earth's magnetic field (affecting the magnetic double-refractions in the ionosphere), (2) change in the electron and carrier densities at the point of reflection in the ionosphere; (3) changes in path length of the ionospheric waves. ABSTRACT NO. 2: The author describes polarisation measurements made on directional fluctuations in wireless direction finders due to night and dawn effects, with particular reference to air navigation. The investigation is carried out with a Braun tube, and oscillograph records are reproduced to show the polarisation of the ionosphere wave. It is shown that distortion is produced by the refraction process at the first layer. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Theoretical analysis)

792. HINMAN, W. S., "A Radio Direction Finder for Use on Aircraft," Bureau of Standards J. of Research, vol. 11, pp. 733-741; December 1933. See also Preliminary Report in Bur. Stand. Tech News Bull.; Proc. IRE, vol. 22, no. 1, pp. 117-118; January 1934. ABSTRACT: A new type of radio direction finder is described which does away with phasing difficulties by using a single loop antenna having a field pattern modified by dissymmetry in the loop-antenna circuit. Visual indication of the "course" is given, and the direction finder is bilateral and unidirectional. The indication of the "course"

is not distorted at any volume level, including complete overload. The characteristics of the incoming signals are not destroyed when "on-course" indications are received, but a loud audio note is produced when the loop antenna is turned either side of "course." The direction finder may be added as a unit to any radio receiving set. It operates on any received signal, with modulated or unmodulated waves. The sharpness of indication is readily controllable. This direction finder is based on the idea of reversing a dissymmetrical loop antenna with respect to ground, thereby producing two equal but opposite distorted field patterns. This is accomplished by alternately grounding the ends of a loop antenna through rectifier tubes and applying the voltage induced in the loop antenna by a radio wave to a radio receiver. The output of the radio receiver is also applied to these rectifier tubes, and a zero-center course indicator is so connected that when the loop antenna is grounded at one end, the course indicator deflects right in proportion to the voltage induced in the loop antenna for that condition. When the loop antenna is grounded at the other end, the course indicator deflects left in a similar manner. Thus the course indicator shows directly a comparison of the two field patterns, and gives zero-center course indication. Flight test were made using broadcasting stations of Washington, D.C., and Baltimore, Md. Steady and accurate bilateral indication of "course" was given, as well as positive localizing action (by the reversal of the course indicator action). The early models contributing to the final development are briefly discussed and their circuit arrangements are given where of interest. (a-1, b-1, c-1, d-1, e-0, f-Description)

793. NAKAI, T., "On Directional Observations of Long-Distance Short-Wave Stations and the Relation between Direction Deviation and Scattering in the Ionosphere," Rep. of Rad. Res. in Japan, vol. 3, pp. 251-258; December 1933. ABSTRACT: Directional observations on some short-wave stations outside the skip distance show that waves may arrive from directions deviating from the true by more than ten degrees, or even several decades, at almost regular times of the day, these deviations being largest for stations near the antipodes. These large deviations seem to be due to scattered waves from the ionised medium about a transmitting station. It appears that the ionosphere is made up of ionic clouds of a complicated nature in which scattering plays an important part in the propagation of short waves. For communications with Rio de Janeiro and Buenos Aires, stations in Japan might adopt such a bearing of beam transmitting aerial as would give more effectual response than is given by the true bearings of these stations at any given time. (a-3, b-1, c-1, d-6, e-0, f-Analysis)

794. NAKAI, T., AND NAKAGAMI, M., "On the Transmission of Short Waves through the North-Polar Night Zone," Rep. of Rad. Res. in Japan, vol. 3, pp. 259-266; December 1933. ABSTRACT: This paper is a preliminary report on field-strength measurements and directional observations carried out at Hiraiso between December, 1932, and February, 1933, with short waves from the New York and Rio de Janeiro stations, both of which were supposed to propagate through the polar night zone at the North Pole. The experiments show that the waves from these stations rarely come from the true direction. It appears that short waves are very difficult to propagate through the north-polar night zone, though details in regard to the ionisation in this zone are still unknown. (a-3, b-1, c-1, d-6, e-0, f-Experiment)

795. SOUTHWORTH, G. C., "Earth Potential Measurements," Proc. IRE, vol. 21, pp. 1740-1748; December 1933. ABSTRACT: The paper contains an account and some graphical records of daily and seasonal variations in earth surface potential gradients which were measured during the Polar Year on seven observation stations in the U.S.A. The technique of measuring the potentials was essentially that of connecting a recording voltmeter into the crust of the earth at two points and measuring the prevailing voltages. If two lines at right angles are used, magnitude and general direction of the voltage gradientdients can be determined. The magnitude of diurnal earth potential variation seems to be related to the homogeneity of the subsoil; the relation between earth potential gradients and geological formations requires further study to lead to more definite results; the nature of the earth potential disturbances also requires further research for its elucidation. (a-3, b-1, c-1, d-1, e-0, f-Experiment)

796. SCHRENK, M. H., "Report of Tests of Simon Direction and Distance Finders (DI-5)," USN, NRL Report No. R-1008; 15 December 1933. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

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797. BORKOWETZ, G., AND HAGEN, A., "New Radio Aid to Navigation (Cathode Ray D.F.)." Wireless World, vol. 35, p. 76, 1934. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

798. BOURGONNIER, C., AND DUREPAIRE, M., "Small Vertical Antenna for Improving Sharpness of Goniometer Minimum, Used Also for Sense Determination," Funk. Tech. Monatshefte, vol. 1, p. 43; 1934. ABSTRACT: Not available. (a-4, b-1, c-5, d-4, e-0, f-0)

799. BRAILLARD, P., AND MARIQUE, J., "A Direct-Reading Direction Finder," Hochf: Tech. u. Elek: akus, vol. 43, p. 107; 1934. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

800. ENDE, W., AND GLOECKNER, M. H., "Direction Finder for Submarines," Electrician, vol. 112, p. 511; 1934. ABSTRACT: Equipment, developed by Marconi's Wireless Telgraph Co., in conjunction with British Naval Authorities; it employs telescopic aerial system, with which it is possible, when traveling submerged to take bearings on any known land-transmitting station or ship. (a-3, b-1, c-1, d-5, e-0, f-Description)

801. ENDE, W., AND GLOECKNER, M. H., "New Radio Aid to Navigation; Cathode-Ray D.F." Wireless World, vol. 35, p. 76; 1934. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

802. GOTHE, A., "The Shield of a Horizontal Receiver Lead Coupled Symmetrically to Two Vertical Antennas to Avoid Errors in Adcock-Type System," Hochf: Tech. u. Elek: akus, vol. 43, p. 43; 1934. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

803. HELL, R., "Combination of Loop and Dipoles to Eliminate Bearing Errors Due to Space Wave," Hoch: Tech. u. Elek: akus, vol. 44, p. 215; 1934. ABSTRACT: Not available. (a-4, b-1, c-4, d-' e-0, f-0)

804. MARCONI, G., "Micro-Wave Wireless Beacon for Harbour Entrance or Navigation Over a Complete Prearranged Course," Marconi Revue, no. 49, p. 27; 1934. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

805. ECKERSLEY, T. L., "Elimination of Night Effect with a Pulse Transmitter," Marconi Revue, vol. 46, pp. 12-16; January-February 1934. See also Wireless Engineer, vol. 11, p. 470; May 1934. ABSTRACT: A method of eliminating night effect in D/F described. The transmitted signal consists of short, spaced pulses. The received signals are displayed on a cathode-ray tube, vertical deflection being caused by the receiving signals and horizontal deflection by a sawtooth wave which is synchronized with the repetition frequency of the transmitted pulses. A succession of signal peaks is thus obtained on the c-r tube screen, representing the direct signal and the various echoes. The bearing is obtained by rotating the loop or goniometer search coil until the direct-ray signal vanishes. (a-6, b-1, c-1, d-5, e-0, f-Descriptive analysis)

806. FRIIS, H. T., FELDMAN, C. B., AND SHARPLESS, W. M., "The Determination of the Direction of Arrival of Short Radio Waves," Proc. IRE, vol. 22, pp. 47-78; January 1934. ABSTRACT NO. 1: Phase-difference method of reception with two antennas. Discussion of relation between delay and vertical angle of reception. Diversity effect. Pulse transmission. ABSTRACT NO. 2: The direction with which short waves arrive at a receiving site is determined either from the phase difference of the received wave at two points, or from the difference in output of two aerials having contrasting directional field patterns. With the latter method two integrating recorders are used. With the former method either a phase-changer is used (with a null method), or a moving-picture camera in conjunction with a kathode-ray oscillograph. This last arrangement requires the transmission of short-time pulses in place of a continuous carrier, and permits the resolution of the composite wave into components separated in time. It is found that the direction of arrival of any single component does not change erratically, and that the components of greater delay arrive at the higher elevation. They may spread over as much as 20°, or less than 1°, in the vertical plane; the extreme angles measured were 8° and 38°. In the horizontal plane the components depart only a few degrees from the great circle path; angular spreads up to 4° have been observed. The angular spread may also be measured without using pulses. Equipments responsive to the horizontal and the vertical components of the electric field respectively yield results in agreement. The methods were tested and the results quoted were obtained on transatlantic signals. The use of highly-directional receiving aerials for improving the quality of radio-telephone links is discussed. (a_1-6,

a_2-3, b-1, c-1, d-1, e-0, f-Analysis)

807. PALMER, L. S., AND TAYLOR, D., "Rectangular Short-Wave Frame Aerials for Reception and Transmission," Proc. IRE, vol. 22, pp. 93-114; January 1934. ABSTRACT: Previous work on the optimum dimensions of tuned rectangular frame aerials for the reception of short waves has been continued, and the theory has been extended to include an additional condition, the fulfillment of which results in a large frame current. The analogous problem of the optimum dimensions of a tuned rectangular transmitting frame actuated by a local oscillator has also been investigated, and the critical dimensions for maximum frame current have been deduced from the theory, and tested experimentally. (a-1, b-1, c-1, d-1, e-0, f-Theory and experiment)

808. SHEARING, G., "Naval Wireless Communication," JIEE, vol. 74, pp. 11-31; January 1934. ABSTRACT: A brief history is given of the use of radio equipment in the Navy since 1896 and modern service requirements are stated. Transmitters and receivers for ship and shore are discussed, and details are given in connection with aerial trunks and receiving cables, aerials and aerial interference, and power supplies. Regarding direction-finding there are sections of the paper concerned with errors, various aerial systems, cable systems, goniometers, adjustments and corrections of D/F apparatus, and an automatic direction-finder. A comprehensive résumé of recent developments in transmission and reception is given, and there is a brief discussion on International Radio Conferences. (a-3, b-1, c-1, d-5, e-0, f-Survey)

809. PALMER, L. S., AND TAYLOR, D., "The Action of a Tuned Rectangular Frame when Transmitting Short Waves," Proc. Phys. Soc., vol. 46, part I, pp. 62-75; Disc., pp. 87-90; 1 January 1934. ABSTRACT: The work described in this communication is a continuation of a paper on the action of a tuned rectangular frame aerial when receiving short waves. The present development deals with the somewhat similar problem of the action of a tuned rectangular frame aerial when transmitting short waves. Experiments are described which show that a variation of the frame-dimensions affects both the frame current and the radiation, and that these quantities will only attain their maximum values if the frame dimensions are suitably adjusted. A theory is developed to account for the observed phenomena, and equations are obtained the solutions of which give approximately the necessary conditions for maximum frame current and maximum radiation. (a-1, b-1, c-1, d-5, e-0, f-Experimental analysis)

810. PALMER, L. S., TAYLOR, D., AND WITTY, R., "The Current Distribution around a Short-Wave Frame Aerial," Proc. Phys. Soc., vol. 46, Part I, pp. 76-87; Disc.; pp. 87-90; 1 January 1934. ABSTRACT: On the assumption that an initial oscillation in any part of a frame aerial is propagated round and round the frame an infinite number of times in both directions, with the consequent formation of stationary waves, a theoretical expression is obtained for the value of the current in any part of the frame. From the expression so obtained the positions and magnitudes of the current antinodes are deduced. The antinodes are fixed in space and are independent of the orientation of the frame to the wave-front. The current at any point of a frame consequently varies as the frame revolves in its own plane. Experimental results are described which verify the conclusions concerning the positions of the antinodes and the effects produced by a revolving frame. Other experiments are in progress to test the deductions concerning the magnitudes of the currents at the antinodes. (a-1, b-1, c-1, d-5, e-0, f-Theory)

811. LaPORTE, F., "The Use of Long-Distance Radio Direction-Finding Bearings," Comptes Rendus, vol. 198, pp. 447-449; 29 January 1934. ABSTRACT: A method of great accuracy than that usually employed is developed for calculating the position of a ship or aeroplane from wireless signals received from stations whose position is known. The calculations are fairly simple. (a-3, b-1, c-3, d-3, e-0, f-Description)

812. BARDOT, F., "Guidage radioélectrique des aeronefs," Revue de l'Armée de l'Air, no. 56, pp. 265-282; March 1934. ABSTRACT: Review of methods and equipment used for radio direction finding on modern aircraft. (a-3, b-3, c-3, d-3- e-0, f-Summary)

813. CLAVIER, A., "U-H-F Radio Communication System (17 Cms)," Onde Elec., vol. 13, pp. 101-125; March 1934. ABSTRACT: General properties of UHF waves: description of oscillation tubes and detection devices. Description of electro-optical system to concentrate the beam. Description of apparatus and of parabolic reflectors. (a-6, b-1, c-3, d-3, e-0, f-Description)

814. GREEN, A. L., "The Polarization of Sky Waves in the Southern Hemisphere," Proc. IRE, vol. 22, pp. 324-344; March 1934. ABSTRACT: In the Southern Hemisphere, and for directions of propagation of downcoming waves very nearly parallel to the lines of force of the earth's magnetic field, the constants of polarization of sky waves deviated by the ionosphere at heights ranging between 94 and 262 km have been measured. At all times the polarization was very nearly circular and right-handed. During the sunrise period, when measurements were thought to be liable to least error, the average value of the ratio of component alternating forces in the downcoming wave was found to be 1.4, the abnormally polarized component being greater than the normally polarized. The angular phase difference between the components was -84 degrees, the normal component leading the abnormal in time, and the sense of rotation of the resultant magnetic vector in the downcoming wave being clockwise. At other times, when the experimental conditions were not quite so suitable, due to the presence of multiple reflections and to phase and amplitude changes of the sky waves, the mean constants of polarization were 1.08 and -89.6 degrees, respectively, again showing circular right-handed polarization. The experimental conditions were carefully made similar to those of Appleton and Ratcliffe in England, these authors having found circular and left-handed polarization for directions of transmission along the lines of force of the earth's magnetic field. Their prediction that observations in the Southern Hemisphere for propagation against the lines of force of the earth's field should show circular polarization with a right-handed sense of rotation, has therefore been verified. As a consequence of this direct test of the influence of the earth's field in the production of magneto-ionic phenomena, including the differential absorption in the ionosphere of the right-handed and left-handed components of an incident plane polarized wave, with the return to the earth of only one component in each hemisphere, it may now definitely be stated that the origin of abnormal polarization in sky waves is to be linked up with the earth's magnetic field. The practical application is to radio direction finding, where it has been found that night errors are due to the abnormally polarized component of magnetic force in downcoming waves. It is therefore to be expected that night errors in bearing should be great for directions of propagation parallel to the lines of force of the earth's field, and less for directions perpendicular to them. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis and experiment)

815. MARIQUE, J., "Measurements and Discussion of Radiation from Ship Stations," Onde Elec., vol. 13, pp. 149-156; March 1934. ABSTRACT NO. 1: From Sommerfeld's and Watson's formula, the author has calculated the radiated power and effective height of antennas on ships. Coastal reflections are discussed. ABSTRACT NO. 2: By the application of the Sommerfeld/van der Pol and the Watson/Eckersley propagation formulae to field-strength measurements made on certain ships cruising in the eastern end of the English Channel the author determines the effective height of the aerials and the power radiated. A table is given comparing the results in terms of the ratio of effective height to geometrical height for the two propagation formulae for various cases. An interesting feature of the results is that very high values for effective heights are obtained when the ships measured are just off Dover. All the measurements were made in Brussels, and it is suggested that this apparent increase is best explained by reflection of the waves from the cliffs of Dover. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

816. RODER, H., "Elimination of Phase Shifts between the Currents in Two Aerials," Proc. IRE, vol. 22, pp. 374-394; March 1934. ABSTRACT: If two aerials (vertical radiations) are fed through transmission lines from a common rf supply, then phase shifts between the currents in the aerial will occur if one aerial varies in capacity or resistance. This will result in a change of the horizontal radiation pattern. As shown in the paper these phase shifts can be eliminated by a certain method of tuning the circuits. The degree of phase compensation attainable, however, depends on the attenuation of the transmission line. Compensation of phase shifts is also possible if an artificial line is inserted at the sending end for reasons of making the effective electrical length of the transmission line any value desired. The results of the experimental investigation were found to be in good agreement with the theoretical analysis. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

817. BARNER, "Direction Finding Recorder C 76," (German: D.V.L.) See: Air Document Index No. R4013 F256-274; April 1934. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

818. DAVID, P., "Radiation Measurements," Onde Elec., vol. 13, pp. 172-188, April 1934. ABSTRACT NO. 1: Description of an apparatus to measure radiation, and a discussion of its precision. ABSTRACT NO. 2: An account of the principles of apparatus used for field-strength measurements is succeeded by a short description of the apparatus employed by the Laboratoire National de Radio-électricité. This is of normal type, with a receiver covering a wave-length range from 100 to 3000 m, a standard signal generator with attenuator and also recording apparatus. The application of this apparatus to the study of transmitters, aerials, antiparasitic arrangements, etc., is discussed and examples are given of results that have been obtained in measurements of the field of (a) the Eiffel Tower transmitter at numerous points covering the whole of France, and (b) the Radio-Paris transmitter at points in France and in the Mediterranean. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

819. KOLESNIKOV, V., "Radio Communications between 100 and 1000 Kilometers," Onde Elec., vol. 13, pp. 271-276; April 1934. ABSTRACT NO. 1: Experimental data and formulas to choose the proper wavelength and power. ABSTRACT NO. 2: After a discussion as to the advantages of short waves for communication over distances between 100 and 1000 km the author gives graphs and formulae obtained from a consideration of the data available from various sources. For day conditions $\lambda = 74.24 - 0.036d$ and for night conditions $\lambda = 97 - 0.013d$, where λ is the wavelength in metres and d the distance in km. The formulae are empirical and are to be taken as giving a general guide as to the best wavelength to be used; a variation of ±7m about the figure given by the formulae is allowable. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Descriptive theory. Note: Science Abstracts dates publication as June 1934)

820. KRAMAR, E., "Impulse Indicating Device for Radio Beacons," E.N.T., vol. 11, pp. 152-154; April 1934. ABSTRACT: In this arrangement two complementary signals are arranged to give a visual indication on a dc instrument as well as an aural indication on a pair of telephones. The received signal from the complementary rays is fed to a transformer across the primary of which is connected the telephones: from the secondary the signal is rectified and passed through another transformer to a gavanometer which is heavily damped and of which the sensitivity is such that it responds only to the first impulse. (a-3, b-1, c-4, d-4, e-0, f-Description)

821 WISE, W. H., "Propagation of High-Frequency Currents in Ground Return Circuits," Proc. IRE, vol. 22, pp. 522-527; April 1934. ABSTRACT: The electric field parallel to a ground return circuit is calculated without assuming that the frequency is so low that polarization currents in the ground may be neglected. It is found that the polarization currents may be included by replacing the r in Carson's well-known formulas by $r\sqrt{1 + i(\epsilon - 1)/2c\lambda\sigma}$. The problem to be solved is that of calculating the electric field parallel to an alternating current flowing in a straight, infinitely long wire placed above and parallel to a plane homogeneous earth. Carson's derivation of this field is based on three restricting assumptions: (1) the ground permeability is unity; (2) the wave is propagated with the velocity of light and without attenuation; (3) the frequency is so low that polarization currents may be neglected. The first of these restrictions is usually of no consequence and the formula would be quite complicated if the permeability were not made unity. As pointed out in a later paper by Carson the second restriction amounts merely to assuming reasonably efficient transmission. The effect of the third restriction begins to be noticeable at about 60 kc. The object of the present paper is the removal of the third restriction. In John R. Carson's paper, "Wave propagation in overhead wires with ground return," Bell Sys. Tech. Jour., vol. 5, pp. 539-554; October 1926, it is stated that the propagation constant is assumed to be a very small quantity in cgs units. Since this follows from the second and third restrictions it cannot be classed as a separate restriction. The second restriction is not explicitly stated in this paper. (a-3, b-1, c-1, d-1, e-0, f-Theory)

822. EWEN, H. A., AND WOODS, F., "Marconi Direction Finder Type D/F 6.9C," Marconi Revue, no.48, pp. 1-8; May, June 1934. See also Engin. Index, p. 308; 1934. ABSTRACT: The article discusses problems and experimental results leading to the design of a direction finder developed by the Marconi Co. for submarines. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

823. LINDER, E., AND WOLFF, I., "Ionized Gas Modulator for Short Radio Waves," Proc. IRE, vol. 22, pp. 791-793; June 1934. ABSTRACT NO. 1: A glow discharge tube is placed between the transmitting and receiving paraboloids to act as a 10 centimeter modulator. It has been found that a gas changes its absorption and index of refraction for electromagnetic waves when its degree of ionization is changed. (See Keck and Zenneck, Hoch Frequenz und Electroakustik, vol. 40, p. 153, 1932) ABSTRACT NO. 2: Attempts to amplitude-modulate oscillators of the Barkhausen or magnetron type usually result in a considerable amount of attendant frequency modulation. In the system of modulation described in this paper the radiation from the source is formed into a parallel beam which is intercepted by some material whose absorption for the waves can be varied. If the amount reflected back is so small as to cause practically no reaction on the source we then have a pure amplitude-modulation system except for the small amount of frequency modulation due to the change of phase of the wave in passing through the modulator. It has been found that a gas changes its absorption and index of refraction for electromagnetic waves when its degree of ionisation is changed. Under practical conditions it is found that for a 10 cm wave about 100 percent modulation can be obtained using a path length of 20 cm in the gas with an accompanying change of index of refraction of 0.3 above and below that of the gas ionised with direct current. Under these conditons the frequency modulation amounts to about $\pi \times$ the modulating frequency, which is satisfactory, for many purposes. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Theoretical analysis)

824. WILKINS, A. F., "Measurement of the Angle of Incidence at the Ground of Downcoming Short Waves from the Ionosphere," JIEE, vol. 42, pp. 582-588; June 1934. ABSTRACT: The paper describes a method of measuring the angle of incidence of downcoming short waves in which the phase difference between the emf's in two similar horizontal aerials at the same height above the ground is determined from the trace on the fluorescent screen of a cathode-ray oscillograph, to the deflecting plates of which are applied the two aerial emf's after similar amplification by receivers of the types developed at the Radio Research Station for cathode-ray direction-finding. As the main object in view is the measurement of the downcoming angles of 20-metre waves from Lawrenceville, New York, working on the radio-telephone circuit to London, the aerial system used is designed for most efficient operation on this wavelength: but it is found quite practicable to use it on wavelengths up to 64 metres and also for signals from directions not widely divergent from that of the straight line at right angles to the aerials. The results obtained show that, over the period January-April, 1933, one main ray accompanied by other and smaller-amplitude rays is, in general, received at Slough from the 20-metre Lawrenceville stations during their normal working period. The average angle of incidence of this main ray is 72° (measured to the normal to the ground). Throughout the first four months of the year, the angle of incidence remained fairly constant over the working period, but, from about the beginning of April, 1933, the angle of incidence of the one main ray which was still present began to grow throughout the day. At the commencement of transmission, at noon GMT, the angle of incidence is of the same order as that obtaining throughout the day in the "winter" months. The angle increases gradually until values of 80° to 85° are obtained towards sunset. A drop in average field strength of the transmissions has also been noted since April. The deduction that one main ray accompanied by smaller-amplitude rays is generally present in the downcoming radiation from Lawrenceville has been confirmed by the preliminary results of some short duration 20-metre pulse transmissions from that station. (a-1, b-1, c-1, d-1, e-869, f-Propagation)

825. KEAR, F. G., "Maintaining Directivity of Aerial Arrays," Proc. IRE, vol. 22, pp. 847-869; July 1934. ABSTRACT: When a directive aerial array is used to maintain a certain minumum of signal in a given direction, or when a group of arrays is employed to provide intersecting space patterns, such as in the radio range beacon, it becomes necessary to maintain an accurate and constant relation between the phase and magnitude of the several aerial currents. Slight detuning effects in one aerial of a group will seriously alter the pattern. To overcome this trouble, a means of excitation has been developed which will hold a constant predetermined relationship between the various currents regardless of wide changes of aerial tuning. In brief, the system involves the use of constant-current transmission lines built out with artificial sections to either (a) 90° in length and connected in parallel, or (b) 180° in length and connected in series. Experimental data show the system to function satisfactorily and to be decidedly noncritical in adjustment. The new airways radio range beacon stations are using the arrangement with marked success and several broadcast stations have also applied its principles to their arrays. (a-1, b-1, c-1, d-1, e-0, f-Description)

826. NAMBA, S., AND TUKADA, T., "A Note on the Deviation of Observed Bearings in High-Frequency Long-Distance Transmission," Rep. of Rad. Res. in Japan, vol. 4, pp. 10-11; July 1934. See also Wireless Engineer, vol. 12, p. 218; April 1935. ABSTRACT: According to the results of protracted experiments, fluctuations in the direction of arrival of HF waves transmitted from stations at moderate distances (2000 to 10,000 km) are generally of the order of about ±5°. From the results of calculations described in the present paper and

also from experimental evidences obtained in moderate-distance transmissions, it is concluded that the "deviated energy" (deviated at ionosphere from the great circle plane) plays an important role when the transmission distance exceeds 16,000 km. At a distance of 18,000 km the energy may arrive at the receiver almost equally from any direction throughout 360°, so far as the effect of attenuation along respective paths is not taken into account. (a-6, b-1, c-6, d-6, e-0, f-Experimental analysis)

827. CHAFFEE, J. G., "Dielectric Properties at Very High Frequencies," Proc. IRE, vol. 22, pp. 1009-1020; August 1934: ABSTRACT: A simple method of determining the dielectric constant and power factor of solid dielectrics at frequencies as high as 20 megacycles, with an accuracy which is sufficient for most purposes, is described. The major sources of error are discussed in detail, and several precautions which should be observed are pointed out. Measurement of the dielectric properties at 18 megacycles of a number of commonly used materials has shown that in general the power factor and dielectric constant are not widely different from those which obtain at frequencies of the order of one megacycle. In addition, the results of an investigation of the input impedance of valve voltmeters at high frequencies are described as an illustration of the further application of this method of measurement. (a-1, b-1, c-1, d-1, e-0, f-Experimental analysis)

828. FAYARD, G., "Method of Measuring the Propagation Velocity of Waves and Application of This Method to Distance Measurements," Onde Elec., vol. 13, pp. 361-371; August-September 1934. ABSTRACT NO. 1: The wave propagation time between two stations A and B is calculated from the sinusoidal modulating frequency which must be applied to A to get B a fixed value of phase angle between the modulating wave as produced at A and as detected at B. Applications to D/F and to distance calculations are discussed. Relative precision of the method is independent of distance. ABSTRACT NO. 2: A wave modulated at audio-frequency is transmitted from station "A," it is detected at station "B" and the audio output of the detector used to modulate a transmitter at "B" whence the signal is retransmitted and received and detected at "A." There will be a phase difference at audio-frequency between the emitted signal at "A" and the received signal, which can be measured. The phase difference introduced by the equipment at "B" can be separately measured and allowed for, hence the phase difference remaining is due to the path length traversed between "A" and "B." The method can thus be used either as a measure of distance or speed of propagation. Various practical applications are suggested, such as the possible use of the method for aerial and marine navigation. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

829. SMITH, S. B., "The Night Performance of the Marconi-Adcock Direction Finder Type D.F.G.8," Marconi Rev., vol. 50, p. 105; September 1934. See also Wireless Engineer, vol. 12, p. 100; February 1935. ABSTRACT: Using the theory of probability in engineering, it will be seen that the improvement in night D/F accuracy due to the use of the Marconi-Adcock aerial is approximately 5 times, and under ordinary circumstances the Adcock accuracy will not be worse than 12.37°, and under precisely similar circumstances the loop will not be worse than 12.35°. After experience with the Adcock aerial, a skilled operator will obtain an all-round night accuracy approaching that possible when using the equipment during the day. Experimental curves are given showing bearing deviations for loop and Adcock antenna systems as a function of time. (a-6, b-1, c-1, d-5, e-0, f-Descriptive analysis)

830. ANONYMOUS, "Model DQ Radio Direction Finder Equipment. A.C. Operation (Submarine Installation)," Radio Corporation of America, Camden, N.J., Instruction Book No. IB23909. See also Department of Commerce PB17769; October 1934. ABSTRACT: These instructions cover the instruction, operation, and servicing of the model DQ direction finder for submarine installations. The equipment is of the 115 volt, a-c, 60 cycle, single phase line operated superheterodyne type and covers the frequency range of 100 to 1500 kc. It indicates the direction of propagation of pure or modulated continuous wave signals (either keyed or unkeyed) at any frequency in this band. Photographs, diagrams, parts lists, and schematics are included. This equipment was manufactured for the Bureau of Engineering, Navy Department. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

831. OKADA, M., "Returning Type Radio Beacon," Radio Research Japan, Report 4, pp. 185-195; October 1934. ABSTRACT: This paper describes experiments with a new type of rotating radio beacon having certain advantageous features that may be regarded as improvements on the one used in England for many years. In the new system, the so-called figure-of-eight pattern is made to rotate cylically, turning back after each half-revolution, thus enabling the bearing to be determined by observing the times of disappearance of the signal twice in one cycle. Moreover, instead of sending the signal wave continuously, 90 dots are sent during the time that the direction of the minimum field intensity rotates 180°, i.e., 1 dot per 2°, so that instead of measuring the time, the correct bearing can be found at once by counting the number of dots from the "North-" or the "South-Signal" to the instant of disappearance of the signal. Test made with an experimental installation of the new system of beacons gave very satisfactory results (a-3, b-1, c-1, d-6, e-0, f-Description)

832. DE PACE, V. C., "Radio Direction-Finding," Alta Frequenza, vol. 3, pp. 598-621; October 1934. See also Science Abstracts, vol 38, p. 121; February 1935. ABSTRACT: After surveying historically the development of the principles on which radio D/F is founded, the author proceeds to the application of such principles to nautical, and particularly to naval, purposes. A careful treatment is given of the deviations observed in radio D/F on board ship, which are due to the influence of the hull and of conductors on board. (a-6, b-1, c-9, d-9, e-0, f-Survey and analysis)

833. HASTINGS, H. F., "Test of Kearfott Aircraft Direction Finder and Homing Device," NRL Report A-1076; October 3, 1934. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

834. ANONYMOUS, "Model DP Radio Direction Finder Equipment, A.C. Operated - Range: 100-1500 K.C.," RCA Victor Company, Inc., Camden, New Jersey: Instruction Book No IB23905; 3 October 1934. See also Department of Commerce No. PB17438. ABSTRACT: These instructions cover the installation, operation, and servicing of the Model DP Direction Finder Equipment. This equipment is designed for operation from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type having a frequency range of 100 to 1500 kilocycles, and when properly installed and calibrated will accurately indicate the direction of propagation of pure or modulated continuous wave signals (either keyed or unkeyed) at any frequency in the band. The various equipments (Models DP, DP-1, DP-3 and DQ) supplied on the same contract, utilize many interchangeable units. It should be noted that the differentiation between the respective models is with respect to the component units required for each installation, rather than any specific method or detail of installation. A table shows the component units comprising each of the respective models of equipment. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

835. ANONYMOUS, "Model DP-2 Radio Direction Finder Equipment A.C. Operation," RCA Victor Company, Inc., Camden, New Jersey: Instruction Book No. IB23907; 3 October 1934. See also Department of Commerce PB17765. ABSTRACT: These instructions cover the installation, operation, and servicing of the Model DP-2 Direction Finder Equipment. This equipment is designed for operation from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type having a frequency range of 100 to 1500 kilocycles, and when properly installed and calibrated will accurately indicate the direction of propagation of pure or modulated continuous wave signals (either keyed or unkeyed) at any frequency in the band. The various equipments (Models DP, DP-1, DP-2, DP-3, and DQ) supplied on the same contract, utilize many interchangeable units. It should be noted that the differentiation between the respective models is with respect to the component units required for each installation, rather than any specific method or detail of installation. A table shows the component units comprising each of the respective models of equipment. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

836. ANONYMOUS, "Model DP-3 Radio Direction Finder Equipment, A.C. Operation (Remote Operation)," RCA Victor Company, Inc., Camden, New Jersey: Instruction Book No. IB23908, 3 October 1934. See also Department of Commerce No. PB17764. ABSTRACT: These instructions cover the installation, operation, and servicing of the Model DP-3 Direction Finder Equipment. This equipment is designed for operation from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type having a frequency range of 100 to 1500 kilocycles, and when properly installed and calibrated will accurately indicate the direction of propagation of pure or modulated continuous wave signals (either keyed or unkeyed) at any frequency in the band. The loop and drive mechanism are arranged for remote operation by means of deck bearings and cable operated drums. The various equipments (Models DP, DP-1, DP-2, DP-3, and DQ) supplied on the same contract, utilize many interchangeable units. It should be noted that the differentiation between the respective models is with respect to the component units required for each installation, rather than any specific method or detail of installation. A table shows the

component units comprising each of the respective models of equipment. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

837. SCHRENK, M. H., "Tests of Type NES-2 Radio Homing Device," NRL Report A-1077; 3 October 1934. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

838. ANONYMOUS, "Simon Radio Range and Direction-Finder," Aeroplane, vol. 47, no. 1224, pp. 552-553; November 7, 1934. ABSTRACT: Radio navigational instrument which gives visually actual bearing of transmitter in degrees off airplane's bow, right or left, and simultaneously indicates its distance by factor which gives ratio of distance traveled to initially known distance. (a-3, b-2, c-1, d-1, e-0, f-Description)

839. BELL, D. A., "Direction-Finding with Ultra-Short Waves," Wireless World, vol. 35, pp. 344-345; November 1934. See also Wireless Engineer, vol. 12, p. 39; January 1935. ABSTRACT: The question of the directional properties of waves of the order of five meters in length is considered. (a-6, b-1, c-1, d-5, e-0, f-Theory)

840. BORKOWETZ, G., AND HAGEN, A., "Experimental Investigation on Night Effect Producing Direction-Finding Errors," Hochf: tech. u. Elek: akus, vol. 44, pp. 174-178, 181-185; November, December 1934. See also Wireless Engineer, vol. 12, pp. 156-158; March 1935. ABSTRACT NO. 1: Apparatus for automatically recording the quality and position of the null or minimum is described. Using this apparatus, investigations of night errors on medium and long waves were made. Tests were made with receivers in different locations recording the same station, with receivers in the same location but on different frequencies, and with receivers at the same location recording transmitters at different locations. An interesting series of experiments are described in which the axis of rotation of the loop is not vertical. A large quantity of experimental data is presented. ABSTRACT NO. 2: An automatic direction-finding recording apparatus is described, which consists essentially of a rotating frame aerial with receiver and a chemical recorder, and the results are presented of a systematic investigation of the night effect with 1 to 4 such arrangements, using broadcast stations for observation. The results show that with several receivers at distances of only about 1/10λ identical curves are obtained. If, however, the receivers are arranged farther apart, at distances of about 1-2-5λ, discrepancies are observed of as much as 6 min,. the curves generally being quite similar to one another. At distances of about 15λ all similarities have disappeared. Broadcast waves in the region 260-680 m have quite different characteristics to those in the region 1400-2000 m. The former vary more rapidly and more frequently, but, in contrast to the latter, allow day bearings to be accurately found. In both wave-length regions the night effects are, on many nights, extra ordinarily large. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Study)

841. GLOECKNER, M. H., "Relationship of Altitude and Accuracy of Directional Bearings," (German: D. V. L.) See: Air Document Index No. R2859 F843; November 1934. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

842. HAUTEVILLE, T., AND OTTO, G., "Technical Foundation of the DVL Pulsed Direction Finding Method,"(German) See: Air Document Index No. RV 62 F; November 1944. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-0)

843. HERMANSPARN, P., "The Use of Loop Antennas for Direction Finding," Funktech. Monatshefte, vol. 11, pp. 424-430; November 1934. See also Wireless Engineer, vol. 12, p. 158; March 1935. ABSTRACT: "Minimum" finders (and the effective height of their antennas: correction curves, etc.); "Maximum" and direct-reading finders; night errors (including the Adcock system). (a-6, b-1, c-4, d-4, e-0, f-Description)

844. LOFFLER, F. A., "Selection of Construction Site for Direction Finder at Cottbus Airport,"(German: D. V. L.) See: Air Document Index R2859 F946; December 1934. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

845. MONTEFINALE, S., "D/F Systems for Ships and Aircraft," Alta Frequenza, vol. 3, pp. 673-704; December 1934. See also Onde Elec., vol. 15, p. 23a; March 1936. ABSTRACT: Characteristics of modern D/F systems used for marine and aerial navigation. Description of both systems and discussion of their differences. (a-6, b-1, c-9, d-9, e-0, f-Description)

846. SCHELTER, G. C., AND SCHRENK, M. H., "Test of Experimental Radio Direction Finder, submitted by Pioneer Instrument Co.," NRL Report No. A-1105; December 1934. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

847. CAHILL, W. J., AND SCHRENK, M. H., "Tests of the Simon Radio Direction and Distance Finder," NRL Report R-1107; 27 December 1934. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

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848. ANONYMOUS, "Description and Operating Manual for the Airborne Direction Finders, Peil I and PeilII,"(German) See: Air Document Index No. R2150 F317; 1935. ABSTRACT: Not available. (a-4, b-3, c-4 d-4, e-0, f-Description)

849. ANONYMOUS, "Radio Direction Finder," (German: Telefunken) See: Department of Commerce PB37120; 1935. ABSTRACT: Type E 37' a NX is a null type radio direction finder with a frequency range of 240 to 520 kc, and designed for ship board operation. The circuit consists of 2 R/F stages, detector and one A/F stage. The sensitivity of the equipment with a 1 v output in a 4000 ohm resistive load paralleled with a 4000 ohm impedance head set is 20 μ V at 300 kc. Schematic, block and wiring diagrams are included. (a-3, b-3, c-4, d-4, e-0, f-Description)

850. ANONYMOUS, "Technical Reports 5, Series 1935, Pages 179-222, Supplement to Technical Reports 5,"(German: Zentrale für Wissenschaftliches Berichtswesen) See: Department of Commerce PB L61486; 1935. ABSTRACT: These ZWB reports consist of several articles. Titles and authors are as follows: Work of the technical group for material problems of the VLF by W. Müller von der Heyden; Work of the committee for aerial photography of the VLF by F. Cranz; Thoughts in regard to aircraft engine development by W. Kamm; Mechanical stresses in valves of high speed internal combustion engines by P. Noack; Landing of a 10 ton aircraft in the Atlantic; Views with regard to control design; Light metal bearing shells; Ignition troubles caused by rain; Drive of gyroscopic devices in high altitudes; Night direction finding with fixed antennas; Atmospheric discharges; Codron piston rings; Accident through welding cracks by Uding; Pre-determined breaking point in the landing gear; Test results of brake linings. A listing of abstracts of current reports from German research organizations, as well as a bibliography of foreign technical papers, appendix, graphs, drawings and photographs are included. (a-3, b-3, c-4, d-4, e-0, f-Reports)

851. PAWSEY, J. L., "Work on Fading and the Ionosphere," Australian Rad. Research Board, Jour. C.S.I.R., Australia, vol. 8, p. 253; 1935. ABSTRACT: Not available. (a-4, b-1, c-1, d-11, e-0, f-0)

852. BARFIELD, R. H., "Some Principles Underlying the Design of Spaced-Aerial Direction-Finders," JIEE, vol. 76, pp. 423-447; (April) 1935. ABSTRACT NO. 1: The paper constitutes a theoretical and experimental investigation of the principal forms of the spaced-aerial or Adcock direction-finder. The analysis is concerned mainly with the determination of two important properties of the systems, namely their performance under the influence of down-coming waves and their efficiency as receivers of wireless energy. These characteristics are reduced to quantitative form by introducing the two factors named respectively "standard-wave error" and "pick-up factor," and the various aerial-system modifications are studied with the object of showing how these factors may be predicted for any given system and how they vary with the dimensions, wavelength, and other characteristics, and also with the constants of the ground on which the aerials are erected. The four principal aerial systems dealt with are the "U" type, the elevated type, the coupled type, and the balanced type. The "standard-wave error" of the type of direction-finders which is based on the principle of the closed loop or coil is first derived theoretically; it is found to be approximately 35° for a large range of wavelengths, and to be independent of ground conductivity and dimensions of the loop within wide limits. Experimental confirmation of this is obtained on short waves (20 to 50 m). The theory of the "U" type is then considered and the method of calculating the standard-wave error for any given case is worked out. The agreement between values obtained in this way and the experimental results is satisfactory. The effect of screening the horizontal members of the system is discussed, but no quantitative

formula for calculating the effect of the screen is found to be obtainable. A description is next given of a series of experiments with the "U" type on short waves, the system being tested by means of locally-generated downcoming waves of variable polarization. This method was employed to measure the effect of screening and burying the horizontal limb of the "U" aerial, as well as to determine the standard-wave error of the unscreened system. Turning to the elevated type, after a brief theoretical discussion, experiments with the rotating form of this system are described; these include determinations of the standard-wave error by means of an elevated transmitter of variable polarization, an investigation of the effect of shortening the lower limbs of the dipoles, and an investigation of the effect of increasing the height of the apparatus above the ground. A working formula is obtained for calculating the standard-wave error for a system of this type. The next modification dealt with is the coupled type, the various forms of which are described and illustrated. A description is given of a medium-wave direction-finder which was constructed to work on this principle. This was tested by means of downcoming waves from a kite transmitter and also by a local injection method. A formula for calculating the performance of the coupled type of aerial is derived from theory based on these experiments. The balanced type, which is next considered, is described in detail and the results of the tests made with the kite transmitter are given. A combination of the coupled and balanced systems, named the balanced-coupled type, is then described. This system was found to have a standard-wave error too low to be measured. Practical tables are given for each system, showing the standard-wave errors for various wavelengths, aerial-system dimensions, and soil conductivities. These tables show that the systems vary very greatly in performance with the conditions and with the details of their design. The pick-up factors of the various systems are dealt with in a separate section. The case of the loop or coil aerial is first dealt with and is used as a standard of reference for the other systems. Each of the spaced-aerial systems is then examined in turn with regard to its properties in this respect. The paper concludes with a comparative table of standard-wave errors and pick-up factors for the various systems. ABSTRACT NO. 2: A theoretical and experimental investigation of the principal forms of the spaced-aerial or Adcock direction-finding system, special attention being paid to the standard-wave error and the pick-up factor. The standard wave is that where both the angle of incidence and the angle of polarisation are 45°, and the error produced in the system at this angle is called the standard-wave error. The pick-up factor is defined as the ratio of the voltage produced across the terminals of the aerial system to the vertical electric field of the incoming wave in V/m. The author shows how both these quantities can be predicted in terms of the dimensions of the aerial system, the wavelength and the characteristics of the ground on which the aerial is erected. Seven types of aerial are considered: the closed loop (standard-wave error 35°, pick-up factor 10-20), the U-type (standard-wave error 12°, pick-up factor 100-200), the screened U-type (standard-wave error 6°, pick-up factor not measured), the elevated or H-type (standard-wave error 2°, pick-up factor 100-200), the coupled type (standard-wave error 1°, pick-up factor 50-100), the balanced type (standard-wave error 6°, pick-up factor 100-200), the balanced-coupled type (standard-wave error less than 1°, pick-up factor 50 100). Many of these aerial systems are studied theoretically and the results are checked by experiment and found to be in satisfactory agreement. (a_1-1, a_2-3, b-1, c-1, d-5, e-466, f-Experimental analysis. See Abstract No. 871)

853. HOWE, G. W. O., AND MONCKTON, "The First Suggestion of the Earth's Magnetic Field as a Factor in Radio Propagation," Wireless Engineer, vol. 12, p. 371; 1935. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

854. KING, R., "A New Type Ultra-High-Frequency Transmitter," Q.S.T., vol. 19, pp. 30-41; 1935. ABSTRACT: The modern ultra-high-frequency transmitting system consists, in general, of a modulated oscillator, a primary radiator, and a more or less elaborate array of secondary antennas to serve as directors or reflectors. Although a system of this sort may be made highly directional, its construction is not simple, it occupies much space, and it is not convenient where portability is desired. A new type of loop transmitter, on the other hand, incorporates in a single, extremely compact unit a multioscillator and a directional antenna system. Its construction, moreover, is very simple, and its directional characteristics are of a useful form. (a-1, b-1, c-1, d-1, e-0, f-Description)

855. MUNRO, G. H., WEBSTER, H. C., AND HIGGS, A. J., "Simultaneous Observations of Atmospherics with Cathode-Ray Direction Finders," Austral Radio Res. Board, Report No. 8, pp. 9-42; 1935. See also Wireless Engineer, vol. 12, p. 499; September 1935. ABSTRACT: Errors due, at short distances to lightning flashes being non-vertical and elevated some distance above earth, and, at greater distances, to indirect rays: intensity of individual atmospherics: mean intensities of sources observed at Toowoomba (iso-intensity lines and the variation in terrain): Comparative constancy of the mean radiating power of a lightning flash in a particular wave-band: night observations (increased intensities, nearly constant between 1500 and 4000 kilometers, indirect ray at least 5 times as intense at night as in daytime, its night intensity being roughly equal to that of direct ray at 1000 kilometers), distribution of sources located by simultaneous observations; discussion of theories of thunderstorm formation, correlation with thunderstorm reports, etc. (a-6, b-1, c-1, d-11, e-0, f-Experimental theory and analysis)

856. NAIRZ, O., "The Telefunken Apparatus for Directional Flying," Telefunken Zeit., vol. 16, p. 43; 1935. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

857. NAKAI, T., "On Propagation of High-Frequency Short Radio Waves of Long-Distance Transmitting Stations," Electrot. Lab. Japan Res., vol 581, p. 1; 1935. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-0)

858. RUNGE, W., "Three-Dimensional Direction Finder," Hochf: tech. u. Elek: akus, vol. 46, p. 215; 1935. ABSTRACT: A linear antenna is mounted perpendicular to a loop. Zero deflection is obtained with the linear antenna is pointed toward the transmitter. (a-4, b-1, c-4, d-4, e-0, f-0)

859. STARIK, M. E., "On the Accuracy of Direction Finders;" Isv. Elektroprom. Slab. Toka; No. 5, pp. 29-38; 1935. See also Wireless Engineer, vol. 12, p. 510; September 1935. ABSTRACT: The dependence of the accuracy of a direction finder on signal strength, sensitivity of the ear, intensity of static and other factors is examined. Two methods of D/F are compared: the minimum method (using a simple rotating frame) and the comparison method (with the Robinson system). With the same sensitivity of the ear to audibility increments the second method appears to be more accurate. The paper also contains some quantitative data and examples. (a-1, b-1, c-2, d-2, e-0, f-Experimentive analysis)

860. WATSON-WATT, R. A., HERD, J. F., AND BAINBRIDGE-BELL, L. H., "Application of the Cathode-Ray Oscillograph in Radio Research," His Majesty's Stationery Office (British); 1935. ABSTRACT: Makes reference to twin channel radio direction finding apparatus and receiving arrangements. (a-4, b-3, c-1, d-5, e-0, f-Referred to by Crampton in 1947. See Abstract No. 2766)

861. WEBB, W. L., "A Marine Compass," Bell Lab. Record, vol. 13, p. 300; 1935. ABSTRACT: Addition of easily operated radio compass would greatly increase value of radio equipment of fishing vessels sailing from New England ports; Bell Laboratories developed marine radio compass to be used as adjunct to radio telephone. (a-3, b-1, c-1, d-1, e-0, f-Description)

862 BRUCE, E., BECK, A. C., AND LOWRY, L. R., "Horizontal Rhombic Aerials," Proc. IRE, vol. 23, pp. 24-46; January 1935. ABSTRACT: This paper discusses the theoretical methods employed by the authors in dimensioning horizontal rhombic receiving aerials. Experimental proof is given of the engineering accuracy of the directivity calculations on which this work is based. There are included brief descriptions of the aerial-to-transmission-line coupling circuits and the resistance terminations for rhombic aerials. (a-3, b-1, c-1, d-1, e-0, f-Theoretical experimentation)

863. HARDY, R., "Radiotelegraphy and Radio Direction-Finding," Rev. Gen. d'El., vol.38, pp. 83-95; January 1935. ABSTRACT: The principles of direction-finding and of radio compasses are explained. A typical radio compass is described. (a-6, b-1, c-3, d-3, e-0, f-Analysis and description)

864. PAWSEY, J. L., "Further Investigation of the Amplitude Variations of Downcoming Wireless Waves," Proc. Cambridge Phil. Soc., vol. 31, pp. 125-144; January 1935. ABSTRACT: Experiments are described for measuring the lateral deviation of radio waves after reflection from the E- and F-regions of the ionosphere. It was found that the greatest lateral deviation observed, 20° or more, was that due to the E-region, and the least, about 0.5°, was due to the normal E-region in the case of a distant transmitter. The time variation of amplitude of a reflected wave was found to be consistent with a random scattering at the ionosphere. In the theoretical discussion it is shown that changing horizontal irregularities, ion clouds, are a very impor-

tant cause of fading. Values are calculated for the average fading periods which would result from the horizontal winds in the neighbourhood of the E-region known to exist from other evidence. These calculated periods agree with the observed and it is inferred that horizontal winds are a very important cause of fading. (a-1,b-1,c-1,d-5,e-0,

865. MARTYN, D. F., AND GREEN, A. L., "The Characteristics of Downcoming Radio Waves," Proc. Roy. Soc Series A, vol. 148, pp. 104-120; 1 January 1935. ABSTRACT: It is shown that the inconsistent results obtained by other workers when measuring the angle of incidence of downcoming radio waves are mainly due to lateral deviation of the elliptically polarised wave from the plane of propagation. A new method of measurement of these angles, which is unaffected by the presence of lateral deviation is described. Using this method, which involves simultaneous reception of signals on three aerial systems, it has been possible to determine all the electrical and geometrical characteristics of the downcoming waves and their variations from second to second. It is found that the measured angles of incidence of the downcoming rays from both E- and F-layers approach the values corresponding to symmetrical reflection, and that a considerable amount of lateral deviation of the downcoming ray is normally present. The polarisation of the downcoming wave is normally-right-handed and approximately circular, but marked departures from the circular form occur. These departures appear to be correlated with the angle between the downcoming ray and the earth's magnetic field. (a-1, b-1, c-1, d-5, e-0, f-0)

866. ANONYMOUS, "Direction Finding Equipment," (German: Telefunken) See: Air Document Index No. R2313 F307; March 1935. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

867. BERNDORFER, F., "Remote Control DF Installation (Type C-96)," (German) See: Department of Commerce PB93886; March 1935. ABSTRACT: This report contains 15 pages of diagrams. (a-4, b-3, c-4, d-4, e-0, f-Installation instructions)

868. ECHERSLEY, T. L., "Scattering, Polarization Errors, and the Accuracy of Short-Wave Direction-Finding," Marconi Revue, vol. 53, pp. 1-8; March, April 1935. See also Wireless Engineer, vol. 12, p. 451; August 1935. ABSTRACT: The existence of scattered radiation is put beyond doubt, and the part it plays in short-wave direction finding is disclosed, in the experiments described here. The writer stresses that it is possible to conceive of receiving arrangements to eliminate the polarization error, but not to eliminate the scattering error: "the limiting accuracy of short-wave D/F is therefore defined by this degree of scattering." The last part of the paper gives a description of spaced aerial tests on the elimination of polarization error. (a-6, b-1, c-1, d-5, e-0, f-Descriptive analysis)

869. GOUGH, J. H., "Test of Models DO, DO-1, DO-2, and DO-3 Radio Direction Finder Equipment (D1-6)," See Department of Commerce PB122796; USN, NRL Report No. R-1134; 13 March 1935. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

870. GOUGH, J. H., AND LYLE, G. A., "Test of Loop Structure Assembly of the Model DQ Radio Direction Finder Equipment," USN, NRL Report No. R-1141; 28 March 1935. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

871. BARFIELD, R. H., "Design of Spaced-Aerial Direction-Finders," JIEE, vol. 76, pp. 423-443; Disc. pp. 443-447; April 1935. ABSTRACT: A theoretical and experimental investigation of the principal forms of the spaced-aerial or Adcock direction-finding system, special attention being paid to the standard-wave error and the pickup factor. The standard wave is that where both the angle of incidence and the angle of polarisation are 45°, and the error produced in the system at this angle is called the standard-wave error. The pick-up factor is defined as the ratio of the voltage produced across the terminals of the aerial system to the vertical electric field of the incoming wave in V/m. The author shows how both these quantities can be predicted in terms of the dimensions of the aerial system, the wave-length and the characteristics of the ground on which the aerial is erected. Seven types of aerial are considered: the closed loop (standard-wave error 35°, pick-up factor 10-20), the U-type (standard-wave error 12°, pick-up factor 100-200), the screened U-type (standard-wave error 6°, pick-up factor not measured), the elevated or H-type (standard-wave error 2°, pick-up factor 100-200), the coupled type(standard-wave error 1°, pick-up factor 50-100), the balanced type (standard-wave error 6°, pick-up factor 100-200), the balanced-coupled type (standard-wave error less 1°, pick-up factor 50-100). Many of these aerial systems are studied theoretically and the results are checked by experiments and found to be in satisfactory agreeme . (a-3, b-1, c-1, d-5, e-0, f-Study, see No. 852)

872. BELLINI, E., "Sense Antenna in Radio Direction Finding," Onde Elec., vol. 14, p. 214; April 1935. ABSTRACT: A note on Bellini's patents for sense antennas. The most favorable connection between the loop and the vertical sense antenna is obtained when a 90° phase angle exists between their currents. (a-1 b-1, c-3, d-3, e-0, f-Description)

873. BRUCE, E., AND BECK, A. C., "Directivity Steering for Fading Reduction," Proc. IRE, vol. 23, pp. 357-371; April 1935. ABSTRACT: Short-wave fading is largely due to phase interference between multiple path signals of varying path length. Fortunately, stable angular differences usually exist between these paths at the point of reception. It is therefore desirable to employ aerial directivity which is "steerable" and sufficiently sharp to accept only one of the several paths in order to reduce this fading. This paper describes experiments made with a "steerable" directive aerial during reception of transoceanic short-wave signals. The results demonstrate that sharp angular discrimination is a basically sound method of combating fading which is due to phase interference. (a-1, b-1, c-1, d-1, d-0, f-Description)

874. FOERSTNER, G., "Ascertaining Position of Aircraft by Radio Bearings," (German: D. V. L.) See: Air Document Index No. R3613 F553; April 1935 ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

875. MARIS, H. B., "Static Locating System," USN, NRL Report No. R-1146; April 1935. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

876. MONTEFINALE, S., "D/F Systems for Ships and Aircraft," Frequenza, vol. 4, pp. 138-513; April 1935. See also Onde Elec., vol. 14, p. 23A; 1936. ABSTRACT: Not available. (a-4, b-1, c-9, d-9, e-0, f-0)

877. ROSANI, S., "Organization of D/F System in Italy," Alta Frequenza, vol. 4, pp. 138-153; April 1935. See also Onde Elec., vol. 15, p. 23A; 1936. ABSTRACT NO. 1: A D/F system for Italy's coasts, as planned by the 1934 International Conference of Bordeaux, is described. ABSTRACT NO. 2: An international commission, sitting in Bordeaux in April, 1934, drew up regulations for a service of radio beacons on the West Mediterranean and East Atlantic coasts. The Italian share will involve the installation by 1944 of 41 stations with ranges varying from 40 to 370 km. The first 4 stations are going into operation immediately. The aerials will be of lattice steel, 45 m high. The electrical equipment has been designed to give great stability and freedom from harmonics. It has been laid down that the field produced by harmonics shall not, at a distance of 3 nautical miles from the station, exceed 0.1% of that of the carrier wave. The modulation, which must be at least 70%, is applied to the anode circuit in the last stage. (a_1-6, a_2-3, b-1, c-9, d-9, e-0, f-Description)

878. BERNDORFER, F., "The Radio Compass of the DVG," (German) See: Air Document Index No. R2111 F374; May 1935. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

879. GOUGH, J. H., "Loop Circuit 'Q' Measurements and Defects of Loop Assembly Construction of Models DO, DO-1, DO-2, DO-3 Radio D/F Equipment (D1-7)," USN, NRL Report R-1162; 24 May 1935. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

880. BERNDORFER, F., "Homing Receiver 'Klein-ZE, Type C 63/64'," (German: ZWB) Research Report No. 38. See also Department of Commerce PB L38418; June 1935. ABSTRACT: The "Klein-Ze, type C 63/64" receiver is designed for aircraft use for homing on radio stations with wave lengths of 200 to 650 meters. The equipment uses a total of seven tubes and operates from a 12-V aircraft battery and a 100-V plate supply battery. The weight of the receiver without accessories is 8.6 kilograms. This report is from the drahtlostelegraphische und Luftelektrische Versuchsstation Gräfelfing," (a-3, b-3, c-4, d-4, e-0, f-Description)

881. BERNDORFER, F., "Description of a Direct Indicating Direction Finder Based on the Principle of Field-Strength Comparison," (German: ZWB) Report No. 415. See also Department of Commerce PB L38452; PB93885; July 1935. ABSTRACT: This report from "Drahtlostelegraphische und Luftelektrische Versuchsstation Gräfelfing" describes a method of taking bearings on the principle of field-strength comparison with visual indication, tested in connection with a small crossed loop. The new method is found superior to the known homing receivers operating on the principle of null indication in that it requires less field strength and is less sensitive to interference. The method is also suitable for use with Adcock systems. Diagrams, schematics, and photographs are included. (a-3, b-3, c-4, d-4, e-0, f-Description)

882. HOYT, R. S., AND MEAD, SALLIE P., "Mutual Impedances of Parallel Wires," Bell System Techn. J., vol. 14, pp. 509-533; July 1935. ABSTRACT: This is a theoretical paper relating to circuits of straight parallel wires traversed by ac under such conditions (ac frequency diameter and spacing of the wires) that the resulting non-uniformity of the current distribution is sufficient to play an important part in determining the mutual and self impedances. The paper deals primarily with the mutual impedances: but incidentally the self impedances are dealt with almost as fully, except that no numerical calculations are made for them. Part I is mainly a discussion of the physical nature of the mutual and self impedances in the generalised manner necessitated by the non-uniformity of the current distribution. It deals with wires which are short enough compared with the wave-length so that the complicating effects of propagation are negligible and so that the current in each wire can be regarded as an aggregate of filamentary currents. Part II establishes, by recourse to electromagnetic wave theory, calculation formulae for the mutual and self impedances per unit length of a pair of long straight parallel transmission circuits forming a square array. Values of the mutual impedance are calculated over a frequency-range of 1 to 1000 kc/sec, for three cases of the circuits, and are compared with measured values. (a-1, b-1, c-1, d-1, e-0, f-Theory)

883. MESNY, R., "Radio Direction-Finding," Onde Elec., vol. 14, p. 417; July 1935. ABSTRACT: Discussion on errors resulting from the site chosen for D/F apparatus. (a-6, b-1, c-3, d-3, e-0, f-Description)

884. APPLETON, E. V., AND NAISMITH, R., "Some Further Measurements of Upper-Atmospheric Ionization," Proc. Roy. Soc., Series A, vol. 150, pp. 685-708; July 1935. ABSTRACT: The critical frequency penetration method is used to make a series of measurements of the ionisations of the regions E, F_1 and F_2 of the ionosphere. The simple theory of ionisation by ultra-violet light from the sun gives a satisfactory explanation of the seasonal variation of the noon values of maximum ionisation in the F_1- and F_1-layers. The variations observed in the F_2-region cannot be explained by this simple theory. The view expressed by certain workers in America that the results for this F_2-layer are totally unreliable is not accepted by the authors who give reasons for believing that the apparently anomalous results obtained for this F_2-layer are chiefly due to a pronounced seasonal variation of molecular temperature. The same reasoning indicates that the summer temperature of the F_2-region of the ionosphere is about 1200°K. Cases have frequently been noted in summer of a special condition of E-layer ionisation in which reflection of waves takes place from both upper and lower surfaces of a thin layer of the ionosphere. Such a state often results in very favourable conditions for long distance high-frequency communication, the usual restrictions at the upper frequency limit due to electron limitation in region F_2 being then inoperative. Occasional observations have been made of a region of slightly higher electron density than the normal F_2-region. An Appendix shows that the use of a frequency modulated transmission, reception being by a sharply tuned receiver whose resonance frequency may be located anywhere within the band covered by the frequency modulation, forms a convenient alternative to the amplitude modulated pulse transmission technique. (a-3, b-1, c-1, d-5, e-0, f-Theoretical analysis)

885. GLOECKNER, M. H., "DF Compensating Procedure," (German: D.V.L.) See: Air Document Index No. R3321 F1020; August 1935. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instruction)

886. THOMAS, H. A., "Exciting the Aerial System of a Rotating Radio Beacon," JIEE, vol. 77, pp. 285-290; August 1935. ABSTRACT: This paper describes a novel method of feeding the spaced-aerial system of a radio beacon transmitter, which has arisen from the consideration of the possibilities of the application of the Adcock-aerial principle to such a beacon. A brief discussion is given of the limitations of the ordinary rotating-coil goniometer arrangement for such a beacon when the transmitted power is high. The alternative method described utilises two power amplifiers to feed the two pairs of spaced aerials. These two amplifiers are supplied with rf voltages by means of a mechanical controller which automatically provides the required time/voltage variations. A description is given of this controller, together with its application to the problem of exciting the two amplifiers. It is shown that such a controller can fulfil the requirements of the excitation apparatus, and it is concluded that the system described would be suitable for incorporation in a full-size rotating radio beacon for marine navigational purposes. (a-1, b-1, c-1, d-5, e-0, f-Description)

887. KING, R., "A Loop Transmitter," Philosophical Magazine, vol. 20, pp. 514-528; September 1935. ABSTRACT: The loop transmitter discussed consists essentially of a square (or other symmetrical figure) of brass tubing with a thermionic valve connected at each corner. In the case of the square, two opposite sides each join the anodes of a pair of valves, the grids being joined in pairs by the other two sides. The anode and grid feeds are at points near the centres of the four sides and all leads, including the kathode and heater connections, are brought to the centre. The theory of such an arrangement is developed from one of the Maxwell field equations, and the form of the directional field is determined, and is found to be the same as that due to a magnetic dipole perpendicular to the plane of the square, and placed at its centre. The frequency depends on the loop dimensions, and also on the reactive components of any impedances connected in series with it, so that the frequency and the size of the loop may be varied independently over a wide range if suitable reactances are used. The radiation resistance of the loop decreases rapidly with reduction of dimensions if the wave-length is maintained constant. One model constructed has a frequency of 102 mc/sec and a second, using "acorn" valves, works on a wave-length of 176 cm, the calculated frequency being in good agreement with the measured one. (a-3, b-1, c-1, d-5, e-0, f-Theory and experiment)

888. SOUTHWORTH, G. C., "Earth-Potential Measurements," Terr. Mag., vol. 40, pp. 237-254; September 1935. ABSTRACT: Data are presented covering the normal diurnal variation of earth-potentials as measured at about a dozen different points, mostly in eastern United States. Most of the data point to the generally accepted view that there is a close relation between earth resistivity and the direction and magnitude of the earth-potentials. However, there are some inconsistencies noted which tend to make this less definite. (a-3, b-1, c-1, d-1, e-0, f-Experiment and analysis)

889. SMITH-ROSE, R. L., "The Electrical Properties of Soil at Frequencies up to 100 Megacycles per Second; with a Note on the Resistivity of Ground in the United Kingdom," Proc. Phys. Soc., vol. 47, pp. 923-931; 1 September 1935. ABSTRACT: Previous measurements have now been extended to 100 mc/sec. Substantially the same method has been used, but in order to provide an overlap with the previous work, the present measurements cover the frequency range of 1 to 100 mc/sec. Check measurements carried out on small fixed resistors indicate that the overall accuracy at the highest frequencies is better than 20 percent. It may now be stated that for normal samples of surface soil taken from the N.P.L. the conductivity is of the order of 10^8 esu at all frequencies up to 1 mc/sec, rising to rather less than twice the value of 100 mc/sec. Over the same frequency range the dielectric constant decreases from about 10^5 at a frequency of 50 c/sec to about 15 at 100 mc/sec. An Appendix draws attention to the electrical-resistivity maps of England and Wales and of Southern Scotland, recently published by the British Electrical and Allied Industries Research Association. A comparison is made between the values therein and those obtained by the author. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

890. FARMER, F. T., AND RATCLIFFE, J. A., "Measurements of the Absorption of Wireless Waves in the Ionosphere," Proc. Roy. Soc., Series A, vol. 151, pp. 370-383; 2 September 1935. ABSTRACT: The reflection coefficients of the two-magneto-ionic components of radio waves, of length 50 to 500 m, reflected at vertical incidence from the ionosphere, have been measured at different times of day. The results are interpreted in terms of Appleton's magneto-ionic theory, and are found to suggest the description given of the ionosphere as an absorbing medium. In the day time considerable absorption occurs in a region in which the refractive index is nearly unity, and which is situated below the maximum of the E-region (the D-region of Appleton and Ratcliffe). At night there is very little absorption except near the top of the wave trajectory, and the magnitude of this absorption is consistent with an electron collisional frequency of 1.5×10^3 - in the F-region. The ordinary wave is appreciably absorbed only when it is group-retarded. The absorption of the extraordinary wave re-

flected from the F-region takes place in the E-region and increases as the magneto-ionic wave-length, 214 m, is approached. (a-1, b-1, c-1, d-5, e-0, f-Theoretical analysis)

891. GEHRT, "Experiments with Continuous Wave Transmitters in Direction Finding," (German: Lorenz) See: Air Document Index No. R3430 F818; October 1935. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

892. KRAMAR, E., "Blind Landing of Aircraft Using Ultra-Short Waves in Europe," Proc. IRE, vol. 23, pp. 1171-1182; October 1935. ABSTRACT: In a previous paper the application of ultra-short waves in connection with navigation, based on the glide path proposed by Diamond and Dunmore was explained, giving not only the advantages of radio beacons for this range of waves, but also pointing out the expediency of using radio beacons operating on ultra-short waves for blind landing. Meanwhile this idea has been developed further and the results of tests made with this method of blind landing are now recorded. Besides the beacons installed in Berlin and Zürich which have been in service for a considerable length of time, the German airports at Hanover, Cologne, and Frankfort will be equipped with radio beacons by the time this paper is published. Similar equipments are in course of installation in the German airports of Munich and Konigsberg, and in the coming months will be installed in France, England, Poland, Austria, Sweden, Čzechoslovakia, Denmark and Japan. (a-1, b-1, c-1, d-1, e-0, f-Description)

893. ANONYMOUS, "Engineering Description of 105-A Type Radio Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey; 11 October 1935. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

894. LEIB, A., AND KUHLEWIND, W., "Rotatable Adcock Direction Finder," Hochf: tech. u. Elek: akus, vol. 46, p. 177; November 1935. See also Wireless Engineer, vol. 13, p. 99; February 1936. ABSTRACT: A hut, rotatable with or without its contents, contains the apparatus and carries the dipoles. (a-1, b-1, c-4, d-4, e-0, f-Description)

895. ANONYMOUS, "Automatic Control of Radio Direction Finder ZE C 107/35," (German: D. V. L.) See: Air Document No. R4013 F711-743); December 1935. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

896. ANONYMOUS, "Model DP-4 Radio Direction Finder Equipment Frequency Range 100-1500 KC, A.C. Operation," RCA Victor Co., Inc., Camden, New Jersey: Instruction Book No. IB23982; December 1935. See also Department of Commerce No. 17763. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the super-heterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The various models of equipment, Models DP-4, DP-5, DP-6, DQ-1, supplied on the same contract, utilize many interchangeable units. It should be noted that the difference between the several models lies in the component unit requirement for each installation, rather than any specific method or detail of installation. The chief difference in the Model DP-4, DP-5, and DP-6 Equipments are in the mounting of the drive arrangement of the loop and operating pedestals. The Model DQ-1 Equipment is designed for installation on submarines only. Flexible loop cable is supplied and used only on Models DP-4 and DQ-1. The shielded transmission line, replacing the loop cable, for Models DP-5 and DP-6, is to be constructed during the installation in accordance with special instructions issued by the Bureau of Engineering. A table lists the component units comprising each of four types of installation. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

897. ANONYMOUS, "Model DQ-1 Radio Direction Finder Equipment - A.C.Operation," RCA Manufacturing Company, Inc., Camden, New Jersey. See Department of Commerce PB17768; December 1935. ABSTRACT: This equipment is designed for installation on submarines and the instructions cover its installation, operation and servicing. It is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The text contains photographs and tables. Diagrams, outlines, schematic diagrams, and graphs are attached. The equipment was manufactured for the Navy Department, Bureau of Engineering. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

898. CHIREIX, H., "Radio Direction-Finding Arrangement Free from Night Error," Rev. Gen., d'El., vol. 38, p. 208D; December 1935. ABSTRACT: The effects of indirect-ray signals are eliminated by transmission of short dots at regular intervals (1/50 sec). If the resulting signal is received by a loop and applied to the vertical plates of a cathode-ray oscillograph, and if a signal in synchronism with the transmitted signal is applied to the horizontal plates, the direct and indirect-ray signals will, in general, appear as separate peaks on the C-R tube screen. The loop or goniometer is rotated until the direct ray signal disappears. (a-6, b-1, c-3, d-3, e-0, f-Descriptive analysis)

899. ANONYMOUS, "Model DP-5 and DP-6 Radio Direction Finder Equipment - A.C. Operation," RCA Victor Company, Inc., Camden, New Jersey. Instruction book no. IB23983, 26 December 1935. See also Department of Commerce PB17762. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder Equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of super-heterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The various models of equipment, Models DP-4, DP-5, DP-6, and DQ-1, supplied on the same contract, utilize many interchangeable units. It should be noted that the difference between the several models lies in the component unit requirement for each installation, rather than any specific method or detail of installation. The chief differences in the Model DP-4, DP-5, and DP-6 Equipments are in the mounting of the drive arrangement of the loop and operating pedestals. The Model DQ-1 Equipment is designed for installation on submarines only. Flexible loop cable is supplied and used only on Models DP-4 and DQ-1. The shielded transmission line, replacing the loop cable, for Models DP-5 and DP-6, is to be constructed during the installation in accordance with special instructions issued by the Bureau of Engineering. For all equipments, the incidental mounting hardward, drive shaft extensions, shielded transmission lines and tools required for making the installation are to be furnished by the Navy. A table lists the component units comprising each of four types of installation. a-1, b-3, c-1, d-1, e-845, f-Instructions)

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900. ANONYMOUS, "Description and Operating Manual for the Airborne Direction Finding Sets," (German) See: Air Document Index No. R210 F456; 1936. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

901. ANONYMOUS, "Technical Reports 1, 1936 Series, Pages 1 - 33," (German) See: Zentrale fur Wissenschraftliches Berichtwesen); 1936. ABSTRACT: This ZWB report consists of various articles. Titles and authors are as follows: the impact motion of the lifting propeller by G. Schoppe; research problems with regard to navigation by Klintzsch; critique of the lectures given by Capon and Allen at the DVL-VLF assembly from October 11 and 12, 1935 in Berlin by W. Kamm; the DVG radio direction finding apparatus EZ111; the new 107/35 E111 radio compass of the DVG; surface protection of aircraft; magnetic testing method; the hyproscopic balanced condition of improved lumber and the influence of humidity on material strength properties by Küch; gluing of plywood with various binding agents by Küch; protection of rubber edges with rubber by K. Riechers; investigation of the corroding influence of extinguishing substances for extinguishing gasoline, heavy oil and metal fires by Panschardt. A list of abstracts of current reports from German research organizations are included. Photographs, tables of data, graphs and drawings. (a-3, b-3, c-4, d-4, e-0, f-Report)

902. HUND, A., Phenomena in High Frequency Systems, New York: McGraw-Hill Book Company, p. 454; 1936. ABSTRACT: An early text which mentions direction finding errors due to conducting objects in the local area. The possibility of a metallic fence acting as a Beverage antenna in the vicinity of a direction finder is mentioned. (a-4, b-6, c-1, d-1, e-0, f-Theory: McGraw-Hill reference series book)

903. KARMALIN, P. V., "On the Design of the Goniometer System for a Fixed-Loop Direction Finder," Izv. Elektroprom. Slab. Toka no. 10, pp. 24-30; 1936. See also Wireless Engineer, vol. 14, p. 91; 1937. ABSTRACT: The relative advantages and disadvantages of D/F's using fixed and rotating-loop antennas are discussed, and a study is presented of the fundamental principles underlying the design of the goniometer system for a fixed-loop direction finder. (Bellini-Tosi). Conditions determined in which the maximum efficiency is obtained. On the basis of this investigation, it is recommended that the frequency range of the system should be split up into a number of steps, with capacities of different values, shunted across the field coils. An outline for the procedure which should be followed in designing the system is given. (a-6, b-1, c-2, d-2, e-0, f-Analysis and evaluation)

904. MARIQUE, J., "Direct Reading Direction Finder," Hochf: tech. u. Elek: akus, vol. 48, p. 216; 1936. See also Wireless Engineer, vol. 14, p. 90; 1937. ABSTRACT: The D/F has a rotating-loop antenna. Signals from the D/F are passed to a glow-discharge tube and the polar diagram of the field strength is seen on a ground-glass screen. (a-6, b-1, c-4, d-4, e-0, f-Description)

905. ROBERTS, H. W., "The Simon Radioguide," Communication & Broadcast Eng., vol. 3, no. 8, pp. 5-7 and 20; August 1936. ABSTRACT: New instrument for radio navigation, which automatically indicates true direction of transmitting station, its bearing in degrees off bow or off beam, approximate ratio of distance traveled toward or away from station, position, and drift. (a-3, b-2, c-1, d-1, e-0, f-Description)

906. ROBERTS, H. W., "The Simon System of Instrument Landing and Collision Warning," Communications, vol. 3, p. 14; and Broadcasting Engineer, no. 10; 1936. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

907. ROCARD, Y., "S.F.R. Radio-Guidance System for Aircraft," Bull. S.F.R., no. 3E4, pp. 51-88, 89-104; 1936. See also Wireless Engineer, vol. 14, p. 508; 1937. ABSTRACT: Among points discussed are the advantages of the phase reversal method of keying. This method consists of reversing the phase either in some stage of the transmitter or in the antennas themselves. It is stated that the long metal wire stays of an airplane, slightly inclined toward vertical, pick up a stronger radiation and tend to reinforce the antenna by diffraction or capacity coupling. Hence it is concluded that horizontal polarization may be more advantageous for aircraft communications. (a-6, b-1, c-3, d-3 e-0, f-Analysis)

908. SHTILLERMAN, L. E., AND PLEMYANNIKOV, A. N., "A Study of Radio Beacons Free from Night Errors," Izv. Elektroprom. Slab. Toka., no. 10, pp. 12-24; 1936. See also Wireless Engineer, vol. 14, p. 91; 1937. ABSTRACT: It is pointed out that in the case of radio beacons using loop antennas, the night effect, i.e., the variation and displacement of the polar diagram, is due to the presence in the radiated field of a horizontally-polarized component perpendicular to the plane of radiation. If, however, Adcock antennas with transmission line feed are used, this component is not radiated, and experiments in Russia have shown that with such antennas the direction of the polar diagram remains constant within 1°, independently of the distance and time of transmission. The operation of a beacon using four vertical antennas at the corners of a square, with a fifth antenna in the center is discussed. Description of a specially-developed goniometer unit is given. (a-6, b-1, c-2, d-2, e-0, f-Experimental theory)

909. WARK, W. J., BOSWELL, R, AND WEBSTER, H. C., "A Directional Recorder for Atmospherics," Australian Rad. Res. Bd., Report No. 10, p. 9; 1936. ABSTRACT: Not available. (a-4, b-1, c-1, d-11, e-0, f-0)

910. WATSON-WATT, R. A., "A Pathologist Looks at Radio Communications," JIEE, vol. 78, p. 10; 1936. ABSTRACT: Not available. (a-1, b-1, c-1, d-5, e-0, f-0)

911. WITTEMAN AND PRUSS, "The Navigation by Radio of the Airships GRAF ZEPPELIN and HINDENBERG," Telefunken Zeit., vol. 17, p. 47; 1936. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

912. AIKEN, C. B., "A Radio Compass for Aircraft," Bell Lab. Record, vol. 14, pp. 165-168; January, 1936. ABSTRACT: Bell Laboratories made available easily operated radio compass for use primarily with Western Electric marine radio telephone equipment, recognizing possibilities of wider usefulness for this visual-indicator instrument, they have incorporated some of basic principles in smaller and light-weight set for use as radio compass for aircraft, equipment described. (a-3, b-1, c-1, d-1, e-0, f-Description)

913. LORING, F. G., "The Radio Direction Finder on Board Ship," Elect. Communication, vol. 14, pp. 209-212; January 1936. ABSTRACT NO. 1: The development of the art of radio D/F to the point where bearings may be obtained by personnel not skilled in radio operation is covered briefly. The results obtainable by such personnel using a "modern" (in 1936) direction finder, and the sources and nature of certain types of errors are discussed. ABSTRACT NO. 2: Reviews the development of direction finding. The establishment of radio beacons (1924 and onwards) using simple characteristic signals on 1000 m, a wave-length comparatively free from interference, rendered the reading of bearings independent of the skilled radio personnel of the ship. Concurrently, the direction-finder itself was simplified and more accuracy made available from it. The degree of accuracy under specified conditions is given. The errors are described under the following headings: (1) night effect error; (2) coast refraction error; (3) error due to reciprocal bearing; (4) quadrantal error; (5) convergency correction. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Descriptive survey)

914. SMITH, S. B., AND HATCH, G. F., "Recent Development in Marconi-Adcock Direction Finding," Marconi Revue, no. 58, pp. 1-14; January, February 1936. See also Wireless Engineer, vol. 13, p. 329; June 1936. ABSTRACT: Sensitivity of Marconi-Adcock direction finders: selectivity: the need for very sensitive receivers associated with Adcock aerials: the Marconi-Adcock type DFG.10 aerial system: night-time accuracy: comparative statistical accuracy of short and medium-wave shielded "U" aerials: limiting accuracy due to site location: quadrature zero clearing: fineness of minima: quadrature "standby" position: remote control: twin channel Adcock D/F's: shielded radiogoniometers: etc. (a-6, b-1, c-1, d-5, e-0, f-Descriptive analysis.

915. WATSON-WATT, R. A., "Polarization Errors in Direction Finders," Wireless Engineer, vol. 13, pp. 3-6; January 1936. ABSTRACT: The paper describes a comparison of the experimental performance of three systems of Adcock spaced aerial direction finder, carried out by cooperation between Marconi's Wireless Telegraph Company and the Radio Research Board. The work covers the carrying out of several thousand observations partly at Chelmsford and partly at Slough, and the results obtained are expressed in terms of the relative standard-wave errors of the three systems. (a-6, b-1, c-1, d-5, e-0, f-Descriptive analysis)

916. FROMY, E., "Radio Direction-Finding Deviations in Aircraft," Onde Elec., vol. 15, pp. 113-132, 167-181, 245-253; February, March, April 1936. ABSTRACT NO. 1: Complete study of D/F errors in aircraft navigation. Calculation of interfering fields, study of goniometrical error, general discussion of the errors; experimental results and mathematical theory. ABSTRACT NO. 2: The use of direction-finding loops on aircraft is complicated by the effect of fields originating from currents circulating in the metal structure of the aircraft due to the incident wave whose direction of arrival it is desired to determine. With the single simplification that the loop is so small that the field is constant over its area the author establishes a perfectly general formula which enables the errors to be determined. Factors affecting these errors are discussed and experimental results cited in support of the theory. Certain simple general rules can be readily deduced. (1) There must be no absorptive or resonant circuit in the neighbourhood of the coil. (2) To obtain a symmetrical error curve the aircraft must be electrically symmetrical and the coil placed in a plane of symmetry. (3) Errors can be eliminated by compensating circuits if care has been taken in the first place to obtain a symmetrical error curve. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theory and experiment)

917. HERMANSPANN, P., "Directional Reception Apparatus with Two Oppositely Connected Dipoles," Hochf: tech. u. Elek: akus vol. 47, p. 68, Feb. 1936. See also Wireless Engineer, vol. 13, p. 386, July 1936. ABSTRACT: Asymmetry due to earth capacities of lower halves of dipoles is corrected by connecting upper halves by horizontal wires and variable condensers. (a-6, b-1, c-4, d-4, e-0, f-Description)

918. PALMER, L. S., "Directional Properties of Short-Wave Frame Aerials," Nature, vol. 137, p. 278; February 1936. See also

Wireless Engineer, vol. 13, p. 213; April 1936. ABSTRACT: When a receiving frame aerial is rotated about an axis parallel to the electric vector of an incident wave, then with long waves the frame current changes from zero to some finite value as the frame rotates from a position where its plane is perpendicular to the direction of wave propagation to a position where its plane is parallel to this direction. Upon this fact the normal directional properties of frame aerial depend. With waves of lengths comparable to the frame dimensions, this is no longer a correct statement. When the frame is perpendicular to the direction of the propagation of short-waves, it is found that current antinodes of equal amplitude occur at the ends AA of that diameter of the frame which is parallel to the magnetic vector H of the wave, and current nodes occur at the ends NN of the diameter parallel to the electric vector E of the wave. Other nodes and antinodes may be symmetrically disposed round the frame at points which depend on the ratio of the wave-length to the frame perimeter. As the frame rotates about the diameter NN, these latter antinodes move round the frame and change in number and magnitude until the current assumes the distribution previously described for a short-wave frame oriented so that its plane is parallel to the direction of wave propagation. When the frame is rotated about the diameter AA parallel to the magnetic vector of the wave, the the current obviously becomes zero when the plane of the frame is again parallel to the direction of wave propagation. With long waves the frame current will be zero for any position of the frame which allows one diameter to be parallel to the magnetic vector of the wave, but with short waves there is only one position for which the frame current is zero, namely, when the plane of the frame is perpendicular to the electric vector of the wave. These results accord with a theory now being developed and have been established qualitatively by using small frames with 40 cm waves under water. The exact way in which the current distribution varies with the position and dimensions of the frame compared with the direction of propagation and length of wave respectively, and the consequences on the directional properties of short-wave frames, is now being investigated. It is hoped that a full account of the work will be published in the near future. (a-1, b-1, c-1, d-5, e-0, f-Theory)

919. LIDONNICI, A., "Il radiogoniometro sui velivoli," Rivista Aeronautica, vol. 12, no. 3, pp. 3 9-327; March 1936. Features of modern aeronautical radiogoniometers, with special reference to Telefunken apparatus. (a-3, b-1, c-9, d-9, e-0, f-Description)

920. ANONYMOUS, "D/F Receiver," (German); 2 March 1936. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

921. ANONYMOUS, "Radio Direction Finder," Hochf: tech. u. Elek: akus, vol. 47, p. 140; April 1936. See also Wireless Engineer, vol. 13, p. 443; 1936. ABSTRACT: Short, regular pulses from the emitter are received by an ordinary D/F and led to the control electrode of a thyratron whose anode voltage is an alternating one of the same frequency as that of the pulse emission. The phase of the anode voltage is adjusted so that anode current only flows while the pulse current is rising, so that the echoes do not influence the circuit at all. (a-6, b-1, c-4, d-4, e-0, f-Description)

922. BELLINI, E., "Sense Antenna in Direction-Finding," Onde Elec., vol. 15, pp. 254-257; April 1936. ABSTRACT NO. 1: Explanation of the fact that in practice the sense antenna must be built longer than the calculated value. ABSTRACT NO. 2: A general survey of the problem leads to a consideration of the different manner in which coils and aerials respond to the electric and magnetic components of the radiation field. Explanation of the differences is given on an energy basis and it is stated to be desirable that the directive and nondirective aerials should both depend on the same component of the field for their pick-up. The Adcock system is suggested as the only satisfactory system meeting the above requirement at the present moment; in fact, were it not for its poor pick-up factor it would in the author's opinion rapidly replace other systems unless considerations of size precluded its use. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

923. EBEL, A. J., "Directional Radiation Patterns," Electronics, vol. 9, pp. 29-30; April 1936. ABSTRACT: The paper deals with the horizontal signal distributions possible for 2-element directional aerials with different current phasing and spacing arrangements. A chart is included for 35 different combinations of time and space phasings and its application is detailed in the text. (a-3, b-2, c-1, d-1, e-0, f-Theory)

924. NICOLAS, P., "Radio Direction Finder without Night Error," Hochf: tech. u. Elek: akus., vol. 47, p. 140; April 1936. See also Wireless Engineer, vol. 13, p. 443; 1936. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

925. LINK, J. C., "Test of Kearfott Direction Finder," NRL Report No. R-1263. See also Department of Commerce PB122745; 12 April 1936. ABSTRACT: 33 pages on AS-101(RDF) and Radio Direction Finder tests. (a-3, b-3, c-1, d-1, e-0, f-Test report)

926. BASHENOFF, V. I., AND MJASOEDOFF, N. A., "Effective Resistance of Closed Antennas," Proc. IRE, vol. 24, pp. 778-801; May 1936. ABSTRACT: This paper discusses the most desirable dimensions for closed aerials. The total resistance of the aerial is broken down into its several components. It is shown that the greatest losses are the dielectric losses in the earth and nearby objects, and formulae are given for calculating this component. Means are discussed for reducing the dielectric losses. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

927. BAUMANN, K., AND ETTINGER, A., "Blind Landing of Airplanes," Proc. IRE, vol. 24, pp. 751-754; May 1936. ABSTRACT: A method for blind landing of aeroplanes is described which differs from the systems used heretofore by great simplification of the equipment. In addition it makes possible the control of the landing maneuvers from the ground. The advantages of the new method are discussed. (a-1, b-1, c-1, d-1, e-0, f-Description)

928. ECKERSLEY, T. L., "Directional Errors from Local Transmitters," Marconi Revue, no. 60, pp. 21-25; May, June 1936. See also Wireless Engineer, vol. 13, p. 608; November 1936. ABSTRACT: This paper shows that calibration of an Adcock D/F by means of a local station may at times be more inaccurate than calibration by means of a more distant station. Both theoretical and experimental evidence is presented. (a-6, b-1, c-1, d-5, e-0, f-Descriptive analysis)

929. ANONYMOUS, "Installing and Operating Instructions Radio Direction Finder Model DR," Airplane and Marine Direction Finder Corporation, Lindenhurst, New Jersey. See Department of Commerce PB17891; June 1936. ABSTRACT: The purpose of this equipment is to provide a portable radio direction finder, covering the frequency range of 200 - 18,000 kc, which is adaptable, without any change, to marine, air station, shore station, or field installation. The following topics are covered in the text-receiver, installation, operation, calibration, maintenance, accessories requiring replacement, spare parts, receiver alignment, parts list, assembly outline, battery box and charging unit drawings, schematic diagram, and photographs. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

930. BUSIGNIES, H., "The Use of Adcock Antennas to Reduce the Night Errors in D/F," Rev. gen. Elect., vol. 40, p. 1; July 1936. ABSTRACT: Communications to the Radio Society of France. No theory; very short article. (a-6, b-1, c-3, d-3, e-0, f-Description)

931. MORGAN, H. K., "Rain Static," Proc. IRE, vol. 24, pp. 959-963; July 1936. ABSTRACT: The problem of rain static, particularly as it affects aircraft, is treated. Rain static is due to particles of rain, snow, or dust striking the aircraft aerials. It has been found that the disturbance is electrostatic in origin and that an electrostatically shielded loop aerial reduces it materially. (a-1, b-1, c-1, d-1, f-Theory)

932. SODEN-FRAUNHOFEN, A. VON G., "Compensation Method of Direction Finding for Ground Stations," (German:D.V.L.) See: Air Document Index No. R4016 F191-202, July 1936. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

933. LINK, J. C., AND BURGESS, W. B., "Test of Model CXN Direction Finder Adapter, Submitted by the Radio Research Co.," NRL Report No. R-1285; 6 July 1936. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

934. ANONYMOUS, "Cathode-Ray Direction Finder," Communication and Broadcast Eng., vol. 3, no. 8, pp. 17-18; August 1936. ABSTRACT: Encouraging results obtained during recent tests conducted by Coast Guard of cathode-ray radio direction finder submitted for test by Airplane and Marine Direction Finder Corp. (a-3, b-2, c-1, d-1, e-0, f-Evaluation)

935. BERNDORFER, F. "The Use of a Fast D.V.G. Recorder to Locate an Aircraft with a Short-Interval Transmitter," (German) See: Air Document Index No. R V-113F; August 1936. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

936. OSTROLENK, S., "The Cathode-Ray Aircraft Compass," Electronics, vol. 9, pp. 12-15, 45-47; August 1936. ABSTRACT NO. 1: The author describes a homing device which uses a cathode-ray indicator, giving a right-left type of indication. ABSTRACT NO. 2: Ordinary direction-finding by transmission from an aeroplane to two ground receiving stations can only be carried on continuously when very elaborate ground facilities are available, but the method is not a paying commercial proposition. The radio compasses in general use depend mainly upon very accurate electrical phasing of the signals received by a directional and a nondirectional aerial, both attached to the aircraft, and this system is greatly affected by night errors. In the instrument described in the present paper, the directional loop is enclosed in a streamline housing and is fixed with regard to the direction of motion of the aeroplane, whilst the nondirectional aerial is a mast attached vertically to the outer structure. Each aerial is connected with a separate rf amplifier, supplied from a common beat-frequency oscillator, and then each amplifier is connected with a separate i.f. amplifier and its output is taken to a pair of deflecting plates of a Braun tube. The effect of the two pairs of plates is to give Lissajous figures and, when the plane is flying directly towards the transmitter, the trace is a vertical line. The line slopes either to the right or the left when the plane is off-course in either direction. Incorrect phasing gives an ellipse in place of the line, but the major axis gives the direction. Incorrect phasing can be put right by adjusting a condenser in parallel with the loop aerial. The compass is free from effects of night error and an interfering transmitter merely produces a minor pattern. (a_1-6, a_2-3, b-2, c-1, d-1, e-0, f-Description)

937. MARIQUE, J., "Visual Direction-Finding," Wireless World, vol. 39, p. 317; September 1936. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

938. SOLT, C. T., "Test of Cathode Ray Direction Finder," Aero Digest, vol. 29, no. 3, pp. 18-19, 84; September 1936. ABSTRACT: Results of tests of finder designed by E. Hefele, conducted by U. S. Coast Guard in radio testing Stinson plane during 150 hr of flying (a-3, b-2, c-1, d-1, e-0, f-Evaluation)

939. BEST, J. E., RATCLIFFE, J. A., AND WILKES, M. V., "Experimental Investigation of Very Long Wave Reflections from the Ionosphere," Proc. Roy. Soc. Series A., vol. 156, pp. 614-633; 1 September 1936. ABSTRACT: Two separate experimental investigations of the wave returned at steep incidence from the ionosphere using a wave-length of 18,800 m are described. In the first experiments the Hollingworth method of plotting the stationary wave system at the ground was used, under such conditions that a determination of the equivalent height of reflection and of the reflection coefficient could be made in the course of a single day or night. There was a marked change in equivalent reflection height in passing from day to night. On a September day the equivalent height was about 74 km, and the reflection coefficient about 0.25: on a November night the corresponding quantities were about 90 km and 0.5. In the second experiments sunset and sunrise variations were observed at a fixed point, 90 km from the transmitter, by using an aerial system arranged so as to be relatively insensitive to the very strong ground wave. These results led to the conclusion that, in winter, the wave was approximately circulary polarised with a left-handed sense, and that the equivalent reflection height increased by about 12 km from day to night. The relation of these results to those of previous workers, is discussed, and certain theoretical conclusions are deduced. (a-1, b-1, c-1, d-5, e-0, f-Theory and experiment)

940. BUSIGNIES, H., "The Automatic Radio Compass and Its Application to Aerial Navigation," Electrical Communication, vol. 15, pp. 157-172; October 1936. ABSTRACT NO. 1: The author describes the Int. Stand. Elect. Corp's. type RC-5 radio compass which uses a single rotating loop. The frequency range is about 300-800 kc. A needle-type indicator is used. Also described is the operation of an aircraft D/F for purposes of navigation. ABSTRACT NO. 2: This article discusses the general principles of radio compasses and described the RC-5 radio compass and applications to aerial navigation. Comparison is made with other methods of navigation by radio, and applications of the radio compass in France and other countries are indicated. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Description)

941. NORTON, K. A., "The Propagation of Radio Waves over the Surface of the Earth and in the Upper Atmosphere, Part I," Proc. IRE, vol. 24, no. 10, pp. 1367-1387; October 1936. ABSTRACT: Simple formulas and graphs are given which represent the ground wave field intensity at the surface of the earth as radiated from a short vertical antenna, at the surface of the earth. The theory is compared to some experimental results by other investigators to determine its range of application. The diffraction formula given is theoretically valid only at the lower frequencies; however, it was shown that sky waves are important both day and night and over land and sea at those distances whose diffraction would otherwise cause a marked decrease in the received field intensity. The attenuation formula given for the short distance where diffraction may be neglected is theoretically valid for any frequency and set of ground constants; experimental data are given which show that the formula may be used even at UHF. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

942. BRILLOUIN, J., "Interference Phenomena between Two Waves of Periodically-Variable Frequency," Rev. gen. Elect., vol. 40, pp. 434-440; 3 October 1936. ABSTRACT NO. 1: The author considers the interference phenomenon between two waves of periodically varying frequency. Because of their diversity and because of the knowledge of the positions of the maxima and minima, it is possible to use heterodyning to measure distances and to locate objects. ABSTRACT NO. 2: The beats which are formed when two frequency-modulated waves interfere are explained and the use of "warble" tones for acoustical measurements is examined. The production of a frequency-modulated tone by motion of the source or by rotating reflectors is described. The possibility of using the interference system to locate sound sources is also mentioned. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

943. ANONYMOUS, "Instruction Book for Radio Set SCR-206-A," Bendix Aviation Corporation, Baltimore, Maryland; 27 October 1936. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

944. BUCHHOLZ, H., "The Relations for the Quasi-Stationary Field of a Closed Rectangular Conducting Loop above the Earth with a Single-Wave Alternating Current," E.N.T., vol. 13, pp. 424-434; December 1936. See also Wireless Engineer, vol. 14, p. 208; April 1937. ABSTRACT NO. 1: The equation determining the field of a complete conducting loop are derived. The subsidiary cases of a loop extending to infinity at one side and of a loop extending to infinity at both sides are also considered. ABSTRACT NO. 2: The author introduces special auxiliary functions to determine the electric and magnetic fields associated with a suspended wire, which approximates to a rectangular loop with one side in the earth, when driven by a sinusoidal emf. These functions are tabulated for the special cases of the wire. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Theory)

945. DIECKMANN, M., AND BERNDORFER, F., "Direct-Reading Direction-Finding Method Using a Rotating Directional System," Hochf: tech. u. Eleck: akus., vol. 48, p. 216; December 1936. See also Wireless Engineer, vol 141, p. 90; February 1937. ABSTRACT: Direction is shown on a cathode-ray tube by a spot deviated (a) by rotation frequency of directional system and (b) by output energy of directional receiver. (a-6, b-1, c-4, d-4, e-0, f-Description)

946. MARIQUE, J., "Direct-Reading Direction Finder," S.A. Internat. d. Teleg. s. Fil. H.U.E., vol. 49, p. 216; December 1936. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

1937

947. ANONYMOUS, "Bench Test of Dual ADF Installation (Radio Compass SCR-269-F)," USN, Naval Air Station, Banana River; ca 1937. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

948. BEHNER, H. J., "The Radio Equipment of the Airship 'Hindenburg' (LZ129)," Telefunken Zeit., vol. 7, no. 73, pp. 44; 1937. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

949. BUNEMANN, O., "A Method for the Automatic Detection of Maxima and Minima in the Response of an Observing Instrument," Manchester Mem. Phil. Soc., vol. 82, p. 95; 1937. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

950. BUSIGNIES, H., "Reduction of Night Error in Radio Direction-Finding Equipment for Aerodromes," Elect. Comm., vol. 16, p. 213; 1937. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

951. DIECKMANN, M., "The Frame in an Abnormally-Polarized Field of Rays," Ges. Vor. Lilienthal-Gesellschaft, p. 338; 1937. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

952. ELSNER, R., AND KRAMAR, E., "Use of Radio Direction-Finding in Aerial Navigation," Lorenz-Berichte, no. 3, p. 106; 1937. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

953. GREEN, A. L., AND BUILDER, G., "Numerical Spacing of Adcock Aerials in Short-Wave Direction Finding," Australian Radio Research Board Report No. 13; 1937. ABSTRACT: Not available. (a-4, b-3, c-1, d-11, e-0, f-0)

954. HARDING, L. M., "False Bearings from Radio Beacons and Their Causes," Lighthouse Conference, Berlin; Topic C-2; 1937. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

955. HARDING, L. M., "Progress in the Development of Ship's Direction Finders," Lighthouse Conf. Berlin, Topic C-5, pp. 1-5; 1937. See also Wireless Engineer, vol. 14, p. 621; 1937. ABSTRACT: Describes a D/F which makes use of a "quasi-minimum" obtained by alternately unbalancing the loop and which gives indication on a center-zero type of instrument, and a D/F which uses crossed loops and two rf amplifiers, and gives indication on a crossed-pointer instrument. (a-6, b-3, c-4, d-4, e-0, f-Description)

956. KARMALIN, P. V., "Electrical Compensation of Deviation in Radio Direction Finders," Izv. Elektroprom. Slab. Toka., No. 9, pp. 1-9; 1937. See also Wireless Engineer, vol. 15, p. 104; 1938. ABSTRACT: Methods are indicated for correcting errors in the Bellini-Tosi D/F's due to re-radiation from nearby metallic objects. The methods proposed are based on modifying the fields of the fixed coils in the goniometer unit; this is achieved by connecting capacities and inductances in parallel with one of the coils. A formula is derived to determine the value of the correcting inductance for a D/F system consisting of inductances. Other formulas are given in which inductances and capacities are taken into account. The variation of error with the operating frequency and methods of compensation are discussed. By using the methods proposed the error can be kept within 1° over the whole frequency range. (a-6, b-1, c-2, d-2, e-0, f-Theoretical analysis)

957. LEITZ, E., "Parts Lists and Drawings for Lenses, Goniometers, Dilameters, etc," FIAT Microfilm Reel No. I-29, Frames 8333-9044 (1929-1938). See also Department of Commerce PB L 73149; 1937. ABSTRACT: Goniometer frames: 8568-8649. (a-3, b-3, c-4, d-4, e-0, f-Goniometers)

958. MARIQUE, J., "Improved Direction Finder," Wireless Engineer, vol. 13, p. 596; 1937. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

959. MARTIN, H. B., "Small-Vessel Direction Finders," RCA Review, vol. 2, p. 69; 1937. ABSTRACT: The use of the radio direction finder or radio compass for navigation purposes is not new. For a period of several years hundreds of coastal, lake and ocean-going ships have realized excellent results from such equipment. Equipment has recently been made available which permits the small boat owner also to take advantage of this radio aid to navigation. The apparatus, while no different electrically from that used aboard large vessels, is, however, specialized in certain features. The principal differences are the space required and ease of installation.... Since the small vessels for which this equipment was designed are invariably of wooden construction, the loop may be inside the cabin, thus avoiding the more elaborate loop-rotating mechanisms employed on larger craft which, of necessity, use an outside loop.... Present-day rotating loop antenna usually consist of several turns of wire enclosed in some form of electrostatic shield. The shield is necessary to reduce the effect of local induction fields and to preserve electrical symmetry. The loop may be considered as an inductance coil, having a relatively short length along its axis, but a large diameter. (a-1, b-1, c-1, d-1, e-0, f-Summary)

960. NORTON, K. A., "Space and Surface Waves in Radio Propagation," Phys. Review, vol. 52, p. 132; 1937. ABSTRACT: In his 1909 solution of the problem of the propagation of radio waves Sommerfeld showed that the radiation field of a vertical electric dipole over a plane earth consisted of a space and a surface wave. In 1935 the author pointed out a discrepancy in sign between Sommerfeld's original solution and the later solutions obtained by Weyl, Sommerfeld, and van der Pol and Niessen; and the author showed that this difference in sign was responsible for the anomalies in transmission ("negative attenuation" and zero field intensity on the ground at finite distances) which had been predicted by the original solution. Recently this correction in sign was verified experimentally by Burrows and theoretically by Wise. Since this correction in sign affects the term which Sommerfeld had identified with a surface wave in such a manner that it does not appear in the asymptotic radiation field of a vertical electric dipole (as is evident in the asymptotic expansion of the vertical dipole wave function which was recently obtained by the author), one might be led to believe that no surface wave exists in the asymptotic field of a vertical electric dipole. However, recent theoretical studies by the author indicate that the radiation from a vertical electric dipole over a plane earth consists of a space and a surface wave component and that the surface wave is just the "ground wave" which is the medium for most low and medium frequency radio communication. The total radiation field [determined by Eqs. (55) and (70)] may be separated into two components E_{sp} and E_{su} which will be identified as space and surface waves:

$$E_{sp} = ik \cos \psi (1 + R_v) \frac{e^{i(kR - \omega t)}}{R} \psi, \tag{1}$$

$$E_{su} = ik(1 - R_v) F \frac{e^{i(kR - \omega t)}}{R} \left[k + r \frac{\cos \psi}{n} \left(1 + \frac{\sin^2 \psi}{2}\right) (1 - \cos^2 \psi / n^2)^{1/2} \right] \tag{2}$$

where

$$F = [1 + i(\pi w)^{1/2} e^{-w} \operatorname{erfc}(-i\sqrt{w})], \tag{3}$$

$$w = \frac{ikR}{2n^2} [(1 - \cos^2 \psi / n^2)^{1/2} + n \sin \psi]^2, \tag{4}$$

$$\operatorname{erfc}(x) = \frac{2}{\pi^{1/2}} \int_x^\infty e^{-u^2} du \tag{5}$$

The sum of (1) and (2) represents the total radiation field of a vertical electric dipole; these equations apply at any point in space above the surface of a (plane) earth such that $R \gg \lambda$ and may be used for any frequency or set of ground constants found in practice. k and r are unit vectors, respectively parallel and perpendicular to the vertical dipole. R_v is the Fresnel reflection coefficient of a plane wave with its electric vector parallel to the plane of incidence and with angle of incidence and with angle of incidence $(\pi/2 - \psi)$, $k = 2\pi/\lambda$ and n is the complex indix of refraction of the earth. The other symbols, not defined, have their usual meanings. The Poynting vectors for the space and surface waves may be determined from (115) and (117) in the above paper

$$S_{sp} = \left[ik \cos \psi (1 + R_v) \frac{e^{i(kR - \omega t)}}{R} \right]^2 \rho, \tag{6}$$

$$S_{su} = \cos \psi \left(1 + \frac{\sin \psi}{2}\right) \left[ik(1 - R_v) F \frac{e^{i(kR - \omega t)}}{R} \right]^2$$
$$\times \left[r - k \frac{\cos \psi}{n} \left(1 + \frac{\sin^2 \psi}{2}\right) (1 - \cos^2 \psi / n^2)^{1/2} \right]. \tag{7}$$

(1) and (6) clearly determine a plane polarized space wave since the energy flows radially and E_{sp} lies in the surface of a hemisphere centered on the base of the radiating dipole. (2) and (7) determine a surface wave with a forward tilt and polarization (determined by the quantity in the square brackets in (2) the same as the surface wave discussed by Sommerfeld. It is of interest to note that the surface wave exists only over an imperfectly conducting earth; over a perfectly conducting earth (since $R_v = 1$) our surface wave disappears and our space wave reduces to the well-known Abraham solution for this case. An evaluation of the intensities of the two waves shows that the space wave represents most of the field for large values of the angle ψ while near the surface, when ψ is small, the surface wave predominates (on the surface $R_v = -1$ so that the surface wave exists alone). Due to the error in sign in his original paper, Sommerfeld supposed that the surface wave was attenuated exponentially as it travels along the ground while our surface wave contains an "attenuation factor" $|F|$. To those familiar with ground wave attenuation theory, this $|F|$ will be readily identified with the "ground wave attenuation factor" which varies.... (a-1, b-1, c-1, d-1, e-0, f-Theory)

961. ROCARD, Y., AND BESSON, P., "Note on the Aerials and Radiation Diagrams of Interlocked Signal Radio Beacons," Bull. S.F.R., vol. 11, p. 33; 1937. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

962. RUNGE, W., "Method of Radio Direction-Finding in Space," Hochf: tech. u Elek: akus, vol. 49, p. 215; 1937. See also Wireless Engineer, vol. 14, p. 508; 1937. ABSTRACT: Increased accuracy is obtained by rotating the whole receiver polar diagram about the axis making a small angle with the direction of maximum. The reception intensity is constant and independent of rotation when the emitter is exactly in the direction of the axis of rotation, with circular cross section of receiver polar diagram. (a-6, b-1, c-4, d-4, e-0, f-Descriptive theory)

963. BLODGETT, E. D. AND DICKEY, E. T., "An Aircraft Radio-compass," Comm. and Broad. Engin., vol. 4, pp. 14-16; January 1937. ABSTRACT: Describes the RCA model AVR-8 radio compass which uses a homing loop or a single rotating loop, visual indication of left-right type, and a superheterodyne receiver. The radiocompass operates on the beacon and broadcast bands. (a-6, b-2, c-1, d-5, e-0, f-Description)

964. BROWN, G. H., "Directional Antennas," Proc. IRE, vol. 25, pp. 78-145; January 1937. ABSTRACT NO. 1: The object of this paper is to develop analytical methods which are readily applicable to the general problems that arise in array design and to provide design curves that may be used without reference to the field theory underlying the problem. The cases of both driven and parasitic arrays have been treated. Where possible, the results have been tested by comparison with experimental results. The field and circuit conditions are treated for the case of multielement driven arrays. The effective impedance and the total radiated power, as well as the power radiated by each antenna, are determined. Expressions are given for the radiation patterns of the arrays. Examples are treated which show how these arrays are used to protect the service areas of other stations operating on the same frequency assignment. In the case of a single parasitic reflector, it is found that spacings less than a quarter wave length are desirable in both the transmitting and receiving case. It is seen that the parasitic antenna functions equally well as a director or a reflector. The case of an antenna parallel to an infinite sheet acting as a reflector is treated. It is shown that it is desirable to space the antenna very much less than a quarter wave length from the sheet. A method of measuring the mutual impedance between antennas is advanced. A systematic method of adjusting a complicated array is outlined. Appendix I shows a method of computing the mutual impedance between a tower and a T antenna. Other appendixes give the derivation of the expressions for the electromagnetic field in the vicinity of a straight wire, end-loaded, and of arbitrary length, and the extension of these expressions to yield the vertical radiation characteristics at great distances. ABSTRACT NO. 2: Analytical methods are developed which are readily applicable to the general problems that arise in array design, and design curves are provided that may be used without reference to the field theory underlying the problem. The cases of both driven and pararitic arrays are treated. Where possible, the results are tested by comparison with experimental results. The field and circuit conditions are treated for the case of multi-element-driven arrays. The effective impedance and the total radiated power, as well as the power radiated by each aerial, are determined. Expressions are given for the radiation patterns of the arrays. Examples are treated which show how these arrays are used to protect the service areas of other stations operating on the same frequency assignment. In the case of a single parasitic reflector, it is found that spacings less than a quarter wave length are desirable in both the transmitting and receiving case. It is seen that the parasitic aerial functions equally well as a director or a reflector. The case of an aerial parallel to an infinite sheet acting as a reflector is treated. It is shown that it is desirable to space the aerial very much less than a quarter wave length from the sheet. A method of measuring the mutual impedance between aerials is advanced. A systematic method of adjusting a complicated array is outlined. Appendix I shows a method of computing the mutual impedance between a tower and a T aerial. Other Apperdixes give the derivation of the expressions for the electromagnetic field in the vicinity of a straight wire, end-loaded, and of arbitrary length, and the extensions of these expressions to yield the vertical radiation characteristics at great distances. (a_1-1, a_2-1, b-1, c-1, d-1, e-0, f-Analysis)

965. BURROWS, C. R., "Radio Propagation Over Plane Earth -- Field Strength Curves," Bell System Tech. Journal, vol. 16, pp. 45-75; January 1937. ABSTRACT: Curves are presented to facilitate the calculation of radio propagation over plane earth. The magnitude and phase of the reflection coefficient for all conductivities of interest and for four values of the dielectric constant are presented in the form of curves from which the significant quantities may be read with the same degree of accuracy for all conditions. Simple equations, from which the effect of raising the aerials above the earth's surface may be readily calculated, are presented. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

966. BUSIGNIES, H., "The Automatic Radio Compass and its Application to Aerial Navigation," Translation in Communication & Broadcast Eng., vol. 4, no. 1, pp. 10-11, 21 and 25; 1 January 1937. See also Aérophile, vol. 44, no. 11, pp. 256-9; November 1936; and vol. 45, no. 1, pp. 14-20; January 1937. ABSTRACT: Description of radio compass RC5; applications to avigation and blind landing; comparison with other methods of radio avigation; use of radio compasses in France and in other countries. (a-3, b-2, c-1, d-1, e-0, f-Description)

967. DAMYANOVITCH A. B., "Principle and Theory of Application of a New Automatic Radio Compass for Aircraft," Onde. Elec., vol. 16, pp. 5-28; January 1937. ABSTRACT NO. 1: A summary of previous work in the D/F field and theoretical description of the use of the Busignie radio-compass. ABSTRACT NO. 2: The loop aerial is continuously rotated, so that the signal from a given station varies sinusoidally with time. The variation has two cycles per revolution due to the polar curve of the loop. On the same shaft as the loop is a two-phase "alternator," which converts from battery supply by means of a circumferential potentiometer. The device generates two cycles per revolution. The indicator is a phase-meter; the stator, iron-cored is excited from the alternator and produces a rotating field; the rotor is a galvanometer coil traversed by the receiver output. The coil is freely pivoted and uncontrolled, and takes up an equilibrium position, its magnetic axis being in line with the rotating field at the instant its own field is a maximum. The coil position thus indicates the phase displacement between the incoming signal and the alternator, and hence the angle between the transmitting station and the aircraft axis. The indicator stator is 2-pole, so that 180° in space are spread around the whole circle of the indicator, doubling the ease of reading. The 180°-ambiguity of the loop aerial is still present. There are three principal errors due to: (1) the induction-motor effect; (2) rotating hysteresis, and (3) eccentricity of the rotating field. The total error is found to be less than ± 1° under normal reception conditions. The indicator is duplicated. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

968. DIEFENBACH, W. W., "Error-Free Bearings with the Pulse Direction Finding Apparatus," Funktech. Monatshefte., vol. 6, pp. 25-27; January 1937. See also Wireless Engineer, vol. 14, p. 272; May 1937. ABSTRACT: Pulse transmission equipment for D/F installed in the "Graf Zeppelin" and the "Hindenburg." (Supplementary note appears on p. 55 of February issue of same magazine). (a-6, b-1, c-4, d-4, e-0, f-Description)

969. NOZIGLIA, J. L., "Radiogoniometros y Radiofaros," Boletin de Informaciones Petroleras, vol. 14, no. 149, pp. 145-55; January 1937. ABSTRACT: Radio direction finders and radio beacons; general considerations; sources of error; simple radio beacons; beacons synchronized with aerial signals and with submarine signals; rotating radio beacons; suggestion for navigators; Marconi marine radio direction finder type 329 T and its operation. (a-3, b-2, c-9, d-9, e-0, f-Description)

970. WISE, W. H., "The Physical Reality of Zenneck's Surface Wave," Bell System Tech. Journal, vol. 16, pp. 35-44; January 1937. ABSTRACT: The first part of the paper shows that a vertical dipole does not generate a surface wave which at great distances behaves like Zenneck's plane surface wave. In Parts Two and Three it is shown that it is not necessary to call upon the Zenneck wave to explain the success of the wave antennas. In 1907 Zenneck showed that a plane interface between two semi-infinite media could support, or guide, an electromagnetic wave which is exponentially attenuated in the direction of propagation along the interface and vertically upwards and downwards from the interface. Zenneck did not show that an antenna could generate such a wave but, because this "surface wave" seemed to be a plausible explanation of the propagation of radio waves to great distances, it was commonly accepted as one of the components of the radiation from an antenna. After Sommerfeld formulated the wave function for a vertical infinitesimal dipole as an infinite integral and noted that the integral around the pole of the integrand is the wave function for a surface wave, which at great distances is identical with the Zenneck wave, no one questioned the reality of Zenneck's surface wave. There has been recently pointed out by C. R. Burrows the lack of agreement between various formulas and curves of radio attenuation

over land when the dielectric constant of the ground must be taken into account. The values of Sommerfeld and Rolf are stated to differ from those of Weyl and Norton by an amount just equal to the surface wave of Zenneck. Burrows presents experimental data supporting the correctness of the Weyl-Norton values and raises a question as to whether a surface wave really is set up by a radio antenna. A vertical current dipole does not generate a surface wave which at great distances behaves like Zenneck's plane surface wave. Theoretical and numerical evidence leading to this conclusion is presented in Part One of this paper. A contemporary theoretical investigation by S. O. Rice leads to the same conclusion. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

971. BESSON, P., "On the Cause of Error in Interlocked Signal Direction Finding," Onde Elec., vol. 16, pp. 81-85; February 1937. ABSTRACT NO. 1: Error due to assymetry of the antenna coupling coil. ABSTRACT NO. 2: It has been observed, with the "A", "N" or other interlocked type of radio beacon, that when very close to the equi-signal course, the type of indication received depends apparently on the tuning of the receiver. The customary explanation for this in the case either of the crossed loop transmitters or the loop and open aerial type as used by the author is that the wave-length for the "A" and "N" is slightly different due to stray effects introduced on account of the keying system. The author found, however, that when using a common master oscillator drive with neutrodyned and symmetrically balanced separator stages the effect still persisted when using modulated C. W. Investigation showed that the amplifier output circuit tuning varied slightly from the "A" to the "N" condition due to certain stray capacities introduced by the keying system. The result was that despite the constancy of frequency the upper and lower side-bands were of different amplitudes in the two cases, and hence according to the tuning of the receiver one or other of the two transmissions appeared the stronger when the receiver was situated practically on the beam. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

972. BURROWS, CHARLES R., "The Surface Wave in Radio Propagation over Plane Earth," Proc. IRE, vol. 25, no. 2, pp. 219-229; February 1937. ABSTRACT: The results of Weyl for radio propagation over plane earth are found to differ from those of Sommerfeld by exactly Sommerfeld's surface wave. Experiments conducted under conditions for which these two theories differ greatly are entirely consistent with Weyl's results and show that Sommerfeld's surface wave is not set up by simple antennas. Accordingly, the Sommerfeld Rolf curves are in error for all conditions for which the dielectric constant cannot be neglected. (a-1, b-1, c-1, d-1, e-0, f-Theory)

973. MARTYN, D. F., PIDDINGTON, J. H., AND MUNRO, G. H., "The Polarization of Radio Echoes," Proc. Roy. Soc., vol. 158, ser. A, pp. 536-551; 3 February 1937. See also Wireless Engineer, vol. 14, p. 261; May 1937. ABSTRACT: The article describes a relatively simple and flexible method of measuring the ellipticity of polarization of waves that have been reflected from the ionosphere. The method uses pulse transmission, and so can be used when multiple reflections are present. A method of determining the sense of rotation of the vectors of the ellipse is described. The results indicate magneto-ionic effects in the E-region, due to electrons, not heavy ions. It is found that the polarization of echoes is elliptical in accordance with Baker and Green's theory of limiting polarization. (a-6, b-1, c-1, d-5, e-0, f-Description)

974. ANONYMOUS, "Group on Aircraft Radio," Lilienthal-Gesellschaft für Luftfahrtforschung, Daily Report No. 073/007; March 1937. See also Department of Commerce No. PB L61847. ABSTRACT: This document is a report on the session of the Lilenthal Society for Aviation Research held March 18, 1937 in Berlin. It contains the text of papers presented by its members and discussions following the presentation. Titles of papers: Ultrashort-wave propagation; Ultrashort-wave field strength calculation; Radiation field in the vicinity of a quarter-wave directional antenna; Regions causing interference in radio receivers and radio direction finders; Review of experiences with short-wave radio service of the Lufthansa; Experiences with pulse and Adcock indirect direction finding; Investigations into direction finding with simple loop antennas; Summary of experiences with direction finding in the German Lufthansa; State of the development work on low altitude meters; Electric altimeter for landing operations; and An echo-sounding method. Charts, diagrams, and graphs are included. (a-3, b-3, c-4, d-4, e-0, f-Report)

975. ECKERSLEY, T. L., "Ultrashort-Wave Refraction and Diffraction," JIEE, vol. 80, pp. 286-304; March 1937. ABSTRACT: The work of G. N. Watson on the propagation of electric waves over a spherical earth has been extended by the author to take account of the finite resistivity of the earth, the effect of which is of great importance in ultra-short-wave transmission. The work is in such a form that the field intensities above the earth can be computed numerically. The effect of refraction in the earth's atmosphere can also be taken into account. The results for a range of wave-length between 2 and 10 mm and for heights up to 4000 m, and distances up to 400 km are published in the paper in a set of curves, the general properties of which are discussed. The effect of atmospheric refraction is considered, and a comparison between observation and theory is made, in which good agreement is obtained, on the average, when neglecting refraction. Major changes may, however, be produced occasionally by refraction. (a-1, b-1, c-1, d-5, e-0, f-Theory)

976. JACKSON, W. E., AND STUART, D. M., "Simultaneous Radio Direction-Finding and Telephone Transmission," Proc. IRE, vol. 25, no. 3, pp. 314-326; March 1937. ABSTRACT: Simultaneous radio direction-finding and telephone service has been in demand on the airways of the U. S. A. for several years. A simple method of obtaining this service has been developed and is now being gradually applied to the airways. Various methods of obtaining simultaneous service are discussed. The effect of linear and square-law detection used with single side-band and double side-band transmission of the range tone are analysed. The single side-band method appears to offer the most practical solution to the problem when used with a linear detector. (a-1, b-1, c-1, d-1, e-0, f-Description)

977. ANONYMOUS: "Direction of Moving Objects by Ultra-Short Waves," Rev. Gen. d'El., vol. 41, p. 136D; April 1937. ABSTRACT: The apparatus consists of an antenna system which produces an interfering field, and a directional receiver. When an object moves in the interfering field, there will be a variation in the intensity of the field received by the receiver. (a-6, b-1, c-3, d-3, e-0, f-Description)

978. ANONYMOUS: "Radio Compasses for Small Boats," Electronics, vol. 10, no. 4, pp. 9-11; April 1937. ABSTRACT: Marine radio direction finder, once restricted by price and size to large ocean going vessels, has appeared in new, inexpensive, compact models suitable for small pleasure craft and fishing boats; its uses and design described. (a-3, b-2, c-1, d-1, e-0, f-Description)

979. GOUGH, J. H. AND BURGESS, W. B., "Test of Models DP-4, DP-5, DP-6, and DQ-1, Radio D. F. Equipment," NRL Report R-1347; April, 1937. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

980. SMITH, S. B., "The Pan American Airways Direction-Finder," Aero Digest, vol. 30, p. 62; April 1937. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

981. WORRALL, R. H., "Test of Model DR Direction Finder Equipment," NRL Report No. R-1353; April 1937. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

982. BARFIELD, R. H. AND FEREDAY, R. A., "An Improved Medium-Wave Adcock Direction Finder," JIEE, vol. 81, pp. 676-681; May 1937. ABSTRACT NO. 1: The paper describes a medium-wave Adcock D/F capable of working over a frequency range of 150-400 kc with a pick-up factor which is between 3 and 5 meters. Under favorable conditions a bearing can be taken with a field strength of 10 microvolts/meter and with a swing of less than 1°. The standard-wave error is less than 1° as measured on a wavelength of 176C meters. This is representative of the error value over entire range. ABSTRACT NO. 2: This paper describes a medium-wave Adcock direction-finder capable of working over the wave-length range 750 to 2000 m (frequency 400 to 150 kc) with a pick-up factor between 3 and 5 m. Under favourable conditions a bearing can be taken on a field-strength of 10 μV/m with a swing of less than 1°. When the field-strength is 1 μV/m the corresponding swing is ± 10°. The standard-wave error is less than 1° as measured on a wave-length of 1760 m (frequency 170 kc) and this may most probably be taken to be representative of its value over the whole range. The instrumental error after balancing is less than 1°, but no information is at present available as to how long the balance remains constant. The instrument may, therefore, be said to constitute a practical development of the balanced-coupled Adcock system, retaining all the advantages of that type as regards polarisation error, but with a greatly enhanced pick-up factor compared with that of the early experimental model, which makes the apparatus capable of taking bearings with field-strengths as low as 1 μV/m, and with an instrumental accuracy as good as that of a loop-type Bellini-Tosi direction-finder. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Descriptive analysis. Note: Science Abstracts date publication as November 1937)

983. SMITH, S. B., "The Extended-Feeder Marconi-Adcock Direction Finder," Marconi Rev., no. 66, pp. 23-30; See also Wireless Engineer, vol. 14, p. 621; November 1937; May 1937. ABSTRACT NO. 1: Describes a Marconi-Adcock D/F with feeders 700 meters long, operating at 300 kc. Discusses operating and site advantages. ABSTRACT NO. 2: Remote control of Adcock aerials; researches have embraced problems such as location of aerials at distances of 0.5 to 8 km by means of radio frequency feeders and telecontrol at distances up to 80 km; some of problems remain unsolved or are uneconomic; number of commercial installations involving extended radio frequency feeders of various lengths up to 0.75 km have been tested. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

984. WOLFF, I., "Determination of the Radiating System Which Will Produce a Specified Directional Characteristic," Proc. IRE, vol. 25, no. 5, p. 630; May 1937. ABSTRACT: Starting with similarity of the radiation pattern from a post of points to a harmonic function, it is shown that with a change in variable, the directional function can be put in a form which permits it to be analyzed into a Fourier Series, each of whose terms represents a pair of sources. The same method is applied to other types of sources and arrays. The relationship is developed between source spacing and the range over which the function can be represented by the series. A number of examples are given to illustrate the application of this method. (a-1, b-1, c-1, d-1, e-0, f-Theory)

985. LOCKHART, "NRL Report on Static Direction Finder Research," USN, NRL Report No. R-1370; 28 May 1937. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

986. ANONYMOUS, "Model DQ-2 Radio Direction Finder Equipment," RCA Manufacturing Company, Inc., Camden, N.J., Instruction Book No. IB 23990. See also Department of Commerce PB17767, p. 54; June 1937. ABSTRACT: These instructions cover the installation, operation, and servicing of the DQ-2 direction finder. This equipment manufactured for the Navy Department, Bureau of Engineering, is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. Photographs, schematic diagrams, drawings, and curves illustrate the text. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

987. APPLETON, E. V., "Regularities and Irregularities in the Ionosphere," Nature, vol. 139, p. 1076; June 1937. ABSTRACT: Selected topics from the information derived from radio sounding of the ionosphere are discussed and considered in connection with results derived from a theory of simple layer formation by solar ionising radiation, travelling rectilinearly and attenuated according to a mass-absorption law. The comparisons are concerned chiefly with the maximum electron content N_m with solar radiation angle of incidence χ, with the total electric conductivity for direct currents such as determines the quiet day magnetic variations, and with the h.f. absorption of radio waves traversing such a simple layer, the last two quantities being, to some extent, related. Other matters discussed are (a) ionisation decay processes in the ionosphere, (b) the actual height at which radio waves are reflected, and (c) ionospheric disturbances. (a-3, b-1, c-1, d-5, e-0, f-Experimentation)

988. ROSS, W., "Ground and Ionospheric Rays," Wireless Engineer, vol. 14, p. 306; June 1937. ABSTRACT: The paper constitutes an attempt to compute the relative intensities of the ground or direct ray and of the ionospheric ray. It is shown that it is not possible to calculate the intensity of the ionospheric ray theoretically because of the incompleteness of our knowledge of the ionosphere. It is shown how the relative intensity of ground ray to ionospheric ray may be estimated for any transmitter whose vertical polar diagram is known. The results are used to estimate the probable useful working-ranges of loop direction finders. (a-5, b-1, c-1, d-5, e-0, f-Theoretical analysis)

989. ANONYMOUS, "Model DP-7 Radio Direction Finder Equipment, Frequency Range - 100-1500 KC, AC Operation," Radio Corporation of America, Camden, New Jersey: Instruction Book No. IB 23988, 30 June 1937. See also Department of Commerce No. PB17411. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder Equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The various models of equipment, Models DP-7, DP-8, and DQ-2, supplied on the same contract, utilize many interchangeable units. It should be noted that the difference between the several models lies in the component unit requirement for each installation, rather than any specific method or detail of installation. The chief difference in the Model DP-7 and DP-8 Equipments are in the mounting of the drive arrangement of the loop and operating pedestals. The Model DQ-2 Equipment is designed for installation on submarines only. Flexible loop cable is supplied and used only on Models DP-7 and DQ-2. The shielded transmission line, replacing the loop cable, for Model DP-8, is to be constructed during the installation in accordance with special instructions issued by the Bureau of Engineering. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

990. ANONYMOUS, "Model DP-8 Radio Direction Finder Equipment Frequency Range 100-1500 KC, AC Operation," Radio Corporation of America: Instruction Book No. IB 23989; 30 June 1937. See also Department of Commerce PB17410. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder Equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The various models of equipment, Models DP-7, DP-8 and DQ-2, supplied on the same contract, utilize many interchangeable units. It should be noted that the difference between the several models lies in the component unit requirement for each installation, rather than any specific method or detail of installation. The chief differences in the Models DP-7 and DP-8 Equipments are in the mounting of the drive arrangement of the loop and operating pedestals. The Model DQ-2 Equipment is designed for installation on submarines only. Flexible loop cable is supplied and used only on Models DP-7 and DQ-2. The shielded transmission line, replacing the loop cable, for Model DP-8, is to be constructed during the installation in accordance with special instructions issued by the Bureau of Engineering. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

991. DIAMOND, H., AND DUNMORE, F. W., "Underground Ultra-High-Frequency Aerial for Aeroplane Landing Beam," U.S. Bureau of Stand. Journ. of Res., vol. 19, pp. 1-19; July 1937. ABSTRACT: Experiments are described on the electrical properties of an uhf transmitting aerial operating very near to and below the ground surface. The work was done with the purpose of locating the landing beam in the centre of an airport in order to secure a steeper approach path and to provide for landing service for different wind directions. The effect of the proximity of the ground to the transmitting aerial upon the low-angle distribution of energy in the radiated field and upon the polarisation of the field is described. An approximate mathematical analysis is given of the mechanism of setting up a landing path when the transmitting aerial is below the ground surface. (a-1, b-1, c-1, d-1, e-0, f-Description. See also Abstract No. 876)

992. FRIIS, H. T., AND FELDMAN, C. B., "A Multiple Unit Steerable Antenna for Short-Wave Reception," Proc. IRE, vol. 25, no. 7, p. 841; July 1937. ABSTRACT: This paper discusses a receiving system employing sharp vertical-plane directivity, capable of being steered to meet the varying angles at which short radio waves arrive at a receiving location. The system is the culmination of some four years effort to determine the degree to which receiving antenna directivity may be carried to increase the reliability of short-wave transatlantic telephone circuits. The system consists of an end-on array of antennas, of fixed directivity, whose outputs are combined in phase for the desired angle. The antenna outputs are conducted over coaxial transmission lines to the receiving building where the phasing is accomplished by means of rotatable phase shifters operating at intermediate frequency. These phase shifters, one for each antenna, are geared together, and the favored direction in the vertical plane may be steered by rotating the assembly. Several sets of these phase shifters are paralleled, each set constituting a separately steerable branch. One of these branches serves as an exploring or monitoring circuit for determining the angles at which waves are arriving. The remaining branches may then be set to receive at these angles. The several receiving branches have common automatic gain control and thus provide a diversity on an angle basis. To obtain the full benefit of the angular resolution afforded by the sharp directivity, the different transmission times, corresponding to the different angles, are equalized by audio delay networks, before combining in the final output. The experimental system, located at the Bell Telephone Laboratories' field laboratory near Holmdel, New Jersey, is described. This system

comprises six rhombic antennas extending three quarters of a mile along the direction to England. Two receiving branches, in addition to a monitoring branch, are provided. Experience obtained with this system since the spring of 1935 is discussed. The benefits ascribable to it are (1) a signal-to-noise improvement of seven to eight decibels, referred to one of the six antennas alone, and (2) a substantial quality improvement due jointly to the diversity action and the reduction of selective fading. While a three-quarter-mile short-wave antenna system is an unusually long one, the steerability feature permits the employment of considerably more directivity, afforded by further increasing the length. A system two miles long is believed to be practicable and desirable. It could be expected to perform more consistently better than the three-quarter-mile trial installation, and should yield a signal-to-noise improvement of twelve to thirteen decibels referred to one rhombic antenna. With the object of predicting the performance of larger systems, the performance of the experimental system is examined in great detail and compared with theory. (a-1, b-1, c-1, d-1, e-0, f-Description)

993. MAINKA, A., "The Influence of Reradiators on Direction-Finding," Funktech. Monatshefte, vol. 6, pp. 201-206; July 1937. See also Wireless Engineer, vol. 14, p. 568; October 1937. ABSTRACT: Contains discussions of decrease of bearing error with increasing phase difference between signal and disturbing fields: compensation of error on airship Hindenburg, s. s. Europa: Funkbeschicker, the Telefunken mechanical error compensator (using metal templates): etc. (a-6, b-1, c-4, d-4, e-0, f-Description)

994. ANONYMOUS, "Testing Instructions for Direction Finders I, Ia, EPI, EPIa, EP2a, and PR1a," (German: Telefunken). See: Air Document Index No. R2188 F688; August 1937. ABSTRACT: Not available, (a-4, b-3, c-4, d-4, e-0, F-Instructions)

995. BOTTCHER, F., "Results with Pulse and Adcock Ground Direction Finders," Luftwissen, vol. 4, pp. 243-247; August 1937. See also Wireless Engineer, vol. 15, p. 391; 1938. ABSTRACT: Exhaustive comparisons are made of loop direction finders using pulse transmission from aircraft with visual indication on a cathode-ray tube, and an "H" Adcock system using normal transmission and aural reception. It is concluded that the Adcock system is much superior, definitely overcoming night and twilight effects. The Adcock system was also much less disturbed by interference: the percentage of test transmissions on which bearings could not be taken owing to interference was for either system in daylight, 3%; for the Adcock at night, 0.5%; and for the loop and pulse system at night, 20%. (a-6, b-1, c-4, d-4, e-0, f-Analysis and evaluation)

996. GREENLEAF, S. A., "Tests on Model DK Direction Finder Receiver to Determine Signal-Noise Characteristics and Make Recommendations as to Any Corrective Action Required on Model DK Receivers in the Service," NRL Report R-1386; August 1937. See also Department of Commerce PB123277. ABSTRACT: 11 pages of graphs and tables. (a-3, b-3, c-1, d-1, e-0, f-Test)

997. LORING, F. G., McPHERSON, W. L., AND McALLISTER, W. H., "Marine Radio Progress, with Special Reference to R.M.S. "Queen Mary"," JIEE, vol. 81, pp. 183-218, Discussion, 218-228; August 1937. ABSTRACT: A summary of the progress in marine radio during the last five years, particularly referring to the nature and volume of traffic, the types of communication involved, and the growing use of direction-finding equipment by navigators. The equipment installed in cargo steamers and passenger vessels other than in express vessels is separately described. More particularly is described the special type of equipment required in the express passenger type of vessel, such as the "Queen Mary." On the latter are four independent duplex circuits. These receive detailed consideration with their power supplied, aerial systems, precautions to ensure efficient multiple working, quick change in wave-length, high-speed transmission and reception, and simultaneous communication, with both sides of the Atlantic. (a-3, b-1, c-1, d-5, e-0, f-Survey)

998. PETZEL, F. W. AND ROBRA, W., "Ground D.F. Stations of State Service for Safety in Aviation," ETZ, vol. 58, pp. 894-898, August 1937. See also Engin. Index, p. 9; 1937. ABSTRACT: Safety in aerial transportation in Germany is discussed. The article describes in detail two phases of practical applications, and of equipment such as beacons and D/F apparatus, and meteorological service to operating personnel before and during flight. A map of the German system is given. (a-6, b-1, c-4, d-4, e-0, f-Discussion)

999. PLENDL, H., "Direction-Finding by Pulses," Hochf: tech. u. Elek: akus, vol. 50, pp. 37-41; August 1937. See also Wireless Engineer, vol. 14, p. 621; November 1937. ABSTRACT NO. 1: A general description of night-errors in D/F is given and the principles of pulse D/F are explained. Some practical results are given. Advantages and disadvantages of the pulse system are discussed. ABSTRACT NO. 2: Discusses the effects on radio direction-finding of night variations in beam direction, and deals with ionospheric effects on long waves. The impulse method of direction-finding is described and practical results obtained with it are quoted. The Adcock and the impulse methods of night direction-finding are compared. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

1000. RUMPF, W., "Experiments on the Use of Adcock Direction Finders for the Near Zone and for the Scattering Zone (730 km)," (German) See: Air Document Index No. R2050 F748; August 1937. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-Experiment report)

1001. BERNDORFER, F., "Minimum-Signal Direction Finder Which Records Rapidly and Directly with a Stroboscope in Conjunction with a Cathode-Ray Tube," (German) See: Department of Commerce PB 56782; September 1937. ABSTRACT: Description of a fast-recording D/F which uses a rotating goniometer and an oscilloscope. The luminescent screen reveals a circle with minimum intensities corresponding to the bearing angle. Signals down to 1. sec duration can clearly be recognized. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Description)

1002. NORTON, K. A., "The Physical Reality of Space and Surface Waves in the Radiation Field of Radio Antennas," Proc. IRE., vol. 25, pp. 1192-1202; September 1937. ABSTRACT NO. 1: The effect of a change in sign in the original Sommerfeld equations for propagation is discussed. Interesting properties of surface waves and the differences between surface and space waves are pointed out. ABSTRACT NO. 2. Evidence is presented which indicates that, notwithstanding the change in sign made by Sommerfeld in his 1926 paper on radio wave propagation, the radiation field of a vertical electric dipole may be separated into space and surface wave components. Sommerfeld's original concepts as to the characteristics of two such waves in radio transmission are largely substantiated. It is shown that a space and a surface wave are generated by a simple vertical dipole antenna at the surface of the earth and that this surface wave has the same wave tilt as the Sommerfeld surface wave. Evidence is given which would indicate that this surface wave travels around the curve of the earth in much the same manner as a guided wire wave travels around a bend on a wire. In the appendix formulas are given for the space and surface waves in the radiation fields of a horizontal electric dipole and of horizontal and vertical magnetic dipoles. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Theory & analysis)

1003. NORTON, K. A., "The Propagation of Radio Waves over the Surface of the Earth and in the Upper Atmosphere," Proc. IRE, vol. 25, pp. 1203-1236; September 1937. ABSTRACT: Completely general formulas are given for computing at any point above a plane earth of finite conductivity the vector electric field for a source which may be a combination of vertical and horizontal electric dipoles or a loop antenna with its axis parallel or perpendicular to the earth. As illustrations of the above general methods, formulas are derived for the ground-wave radiation from: (1) a grounded vertical antenna carrying a sinusoidal current distribution, and (2) elevated vertical and horizontal half-wave antennas. The "effective height" of the grounded vertical antenna is determined as a function of the ground constants, and this formula is then used to determine the effect of the ground constants on the ground-wave field intensity in the neighborhood of a quarter-wave antenna. The formulas are also used to show the influence of antenna height on the attenuation of high and ultra-high frequencies. The forward tilt, i.e., E_r/E_z, which occurs for the electric vector lying in the vertical plane passing through the antenna, is also easily computed from the formulas given and is shown graphically. An expression for the Poynting vector is derived, and it is shown that a part of the energy in the wave near the ground flows downward into the ground. (a-1, b-1, c-1, d-1, e-0, f-Theory)

1004. ROBERTS, H. W., "Navagation with Loop Antennas," Aero Digest, vol. 31, no. 3, p.72 and 74; 3 September 1937. ABSTRACT: Description of loop principle; application of vertical loop to aircraft radio direction finders; installation factors; nondirectional and directional radiators; reciprocal bearings. (a-3, b-2, c-1, d-1, e-0, f-Description)

1005. ROCARD, Y., "Improvements in Radio Direction-Findings," Rev. Gen. d'Elec., vol. 42, pp. 101-102; September 1937. See also Wireless Engineer, vol. 15, p. 49; 1938. ABSTRACT: A description of Rocard system depending on equality of reception on two alternated systems of open antennas with differing diagrams. The two antenna systems may consist of a vertical antenna with a double set of reflectors, alternately switched into action; for removal of ambiguity, both reflector systems can be switched out of action together so that the directive diagram is compared with an all-around diagram. (a-6, b-1, c-3, d-3, e-0, f-Description)

1006. BADENACH, R. M., "Telecommunication Services for Civil Aviation," Inst. Eng. Australia J., vol. 9, pp. 413-421; October 1937. ABSTRACT: A review of the more important radio aids to navigation of aircraft. The disadvantages of the longer waves used in the earlier established system in U.S.A., for example, are discussed, and the possibilities of using short waves for a similar system in Australia. Radio services for airport control and weather broadcasting are also mentioned. (a-3, b-1, c-1, d-11, e-0, f-Survey)

1007. MORRISON, J. F., "Current Amplitude and Phase Relations in Aerial Arrays," Proc. IRE, vol. 25, pp. 1310-1326; October 1937. ABSTRACT: The paper describes a simple arrangement for observing the relative amplitudes and phases of the currents in the elements of a multi-element radiating system. The process of adjusting the array is greatly facilitated, much less time and skill being required than when each step in the process is checked by field-intensity measurements. Using the method described, these measurements need only be used as a final verification of the adjustment. Field experience with a commercial application is described. The arrangement is also suitable for use by operating personnel in making routine checks to verify the maintenance of the desired amplitude and phase relations or to indicate the direction and magnitude of changes if they have occurred. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

1008. WELLS, N., "Series Phase Aerial Array," Wireless World, vol. 41, pp. 374-376; 15 October 1937. ABSTRACT: A number of 1/4 - λ loops at 1/4 - λ intervals are connected by horizontal members of that length. The array is fed at one end with a travelling wave. Up and down the legs of each loop the effects combine to that of a standing wave. Since the resulting radiation of each loop is spaced a 1/4 cycle in both space and time from that of the next, the result is additive along the line in the direction towards the fed end, and cancels out in the reverse direction. Because the direction of propagation is along the line of the array and not perpendicular to it, the cost of the aerial and the space occupied are proportional to the concentration required and not to its square. (The concentration is obtained in all planes.) Up to four arrays may be arranged side by side (usually spaced 3/4 λ) to increase the concentration. An outstanding feature is that the radiation resistance of each loop is four times that of a 1/4 - λ aerial; it is of the order of 150 Ω. For transmission the array may be extended to 6 λ (25 loops); but 2 to 2-1/2 λ is the practical limit for receiving. The terminating resistance (to prevent reflection) may be omitted from a long array. In order that attenuation along the series of loops shall be neither too rapid nor too slow, the dimensioning of the aerial loops and the horizontal members has to be carefully graded according to the frequency and the length of a complete element. A system of longitudinal earth wires is used to reduce variations due to ground conditions. (a-3, b-1, c-1, d-5, e-0, f-Description)

1009. BUDENBOM, H. T., "Proper Spacing between Units of Differential Antenna Pairs in Direction Finding," Bell Telephone Laboratory, New York City, Memo No. 1937-311-HTB-XD; 27 October 1937. ABSTRACT: Not Available. (a-4, b-3, c-1, d-1, e-0, f-0)

1010. BARFIELD, R. H., AND ROSS, W., "A Short-Wave Adcock Direction Finder," JIEE, vol. 81, pp. 682-690; November 1937. ABSTRACT NO. : The working-wavelength range of the system is 35-70 meters. The system consists of 30 ft vertical "water pipe" antennas with netting-shielded feeders, cage-shielded receiving apparatus and a special goniometer with two search coils in parallel mounted on the same spindle. Material for the calculation of permissible tolerance in the antenna system for a given degree of accuracy is given. The latest model of this D/F gives standard-wave error of 1°-4°, a pick up factor of 4m - 10m, and an instrumental error of 2-1/2° maximum. It has a sense-finding device based on a new principle; the device is not described. ABSTRACT NO. 2: This paper gives full details of the construction and performance of a short-wave aural Adcock direction-finder of the coupled type with a working wave-length range of from 35 to 70 m (frequency 8.6 to 4.3 mc). It describes how the design of the instrument is based on the principles brought to light in an earlier investigation. It deals with its design in respect of polarisation error, pick-up factor, and instrumental error, and describes experiments by which these properties were measured. The values obtained for these were as follows: standard-wave error, 3° to 8°; pick-up factor, 4.5 to 6 m; instrumental error, 2° to 3° at maximum. The apparatus is considered to constitute a satisfactory direction-finder from a practical point of viewthough, it will be possible in future models, one of which is now completed, to take advantage of the experience gained to obtain an instrument with lower instrumental and polarisation errors and higher pick-up factor. As a result of minor modifications in design the following performance has been attained: Standard-wave error, 1° to 4°; pick-up factor, 4 to 10 meters; instrumental error, 2-1/2° (maximum). Other improvements have also been introduced, such as the provision of switches enabling lining-up tests to be made quickly and as a matter of routine and the addition of a sense-finding device operating on a new principle. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

1011. BARFIELD, R.H. AND FEREDAY, R. A., "Improved Medium-Wave Adcock Direction Finder," JIEE, vol. 81, pp. 676-681; November 1937. ABSTRACT: This paper describes a medium-wave Adcock direction-finder capable of working over the wave-length range 750 to 2000 m (frequency 400 to 150 kc) with a pick-up factor between 3 and 5 m. Under favourable conditions a bearing can be taken on a field-strength of 10μV/m with a swing of less than 1°. When the field-strength is 1μV/m the corresponding swing is ± 10°. The standard-wave error is less than 1° as measured on a wave-length of 1760 m (frequency 170 kc) and this may most probably be taken to be representative of its value over the whole range. The instrumental error after balancing is less than 1°, but no information is at present available as to how long the balance remains constant. The instrument may, therefore, be said to constitute a practical development of the balanced-coupled Adcock system, retaining all the advantages of that type as regards polarisation error, but with a greatly enhanced pick-up factor compared with that of the early experimental model, which makes the apparatus capable of taking bearings with field-strengths as low as 1 μv/m, and with an instrumental accuracy as good as that of a loop-type Bellini-Tosi direction-finder. (a-1, b-1, c-1, d-5, e-0, f-Description)

1012. BERNDORFER, F., "Bearing-Angle Oscillograph, Type 164/165, Model 954/955," (German; D. V. L.) See: Air Document Index No. R2743 F451; November 1937. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1013. DIAMOND, H. AND DUNMORE, W., "Experiments with Underground Ultra-High-Frequency Antenna for Airplane Landing Beam," Proc. IRE, vol. 25, no. 12, pp. 1542-1560; December 1937. ABSTRACT: Experiments are described on the electrical properties of an ultra-high-frequency transmitting antenna operating very near to and below the ground surface. The work was done with the purpose of locating the landing beam in the center of an airport in order to secure a steeper approach path and to provide for landing service for different wind directions. The effect of the proximity of the ground to the transmitting antenna upon the low angle distribution of energy in the radiation field and upon the polarization of the field is described. An approximate mathematical analysis is given of the mechanism of setting up a landing path when the transmitting antenna is below the ground surface. (a-1, b-1, c-1, d-1, e-0, f-Experimental study. See also Abstract No. 855)

1014. TAYLOR, P. B., "Theory of Loop-Antenna with Leakage between Turns," Proc. IRE, vol. 25, pp. 1574-1594; December 1937. ABSTRACT: The theory of the receiving loop antenna of two turns with distributed leakage, conductive and reactive, is developed. Equations are derived for currents and voltages along the loop and at the terminals. For terminal currents and voltages the effect of leakage may be expressed by means of a single function, H, and the loop may be represented by an equivalent two-mesh circuit of lumped constants. The effect of leakage upon the Q in the presence of leakage is analysed. Experimental applications are described. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

1015. ZIJLSTRA, P., "Radio Landing Beacons for Aerodromes," Philips Techn. Rev., vol. 2, pp. 370-376; December 1937. ABSTRACT: Following a short introduction dealing with the principles of radio landing beacons and a consideration of the advantages and disadvantages of long and short waves for this purpose, the radiation diagrams of modern landing beacons working on ultra-short waves are discussed in detail. Finally, a description is given of the Philips ultra-short wave beacon transmitter B.R.A. 075/4. (a-1 b-1, c-1, d-1, e-0, f-Description)

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1016. ANONYMOUS, "An Automatic Direction Finder," Communications, vol. 18, no. 10, pp. 10-11, 28-29; 1938. ABSTRACT: Describes the Sperry-RCA automatic D/F, which uses a tuned loop in a tear-drop housing with manual or motor rotation of the loop. The loop seeks the null by servo control of motor. An automatic "sense" device is included in the circuit to give the servo-system intelligence for elimination of the 180° ambiguity. The system can also be connected to the gyro-pilot for beam flying. (a-6, b-1, c-1, d-1, e-0, f-Description)

1017. ANONYMOUS, "Automatic Radio Compass RC5E," Communications, vol. 17, p. 34; 1938. ABSTRACT: A brief description of the Type RC5E radio compass developed by the I.T. and T. Laboratory (Paris). The system uses a single rotating loop with a phase-meter type of indicator. (a-6, b-1, c-3, d-3, e-0, f-Description)

1018. ANONYMOUS, "Descriptive Data Covering Phase Comparison Loop Antenna Type 1.5 - 25 Megacycle High Frequency Radio Direction Finders," Bell Telephone Laboratories, New York City; 1938. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Description)

1019. ANONYMOUS, "Instruction Book for Radio Compass SCR-269-A and Radio Compass SCR-269-C," U. S. Navy: NavAer-08-5Q 161; See also Department of Commerce PB14914; 1938. ABSTRACT: Radio Compass SCR-269-A (or -C) was designed primarily to be used as a navigational instrument in U. S. Army aircraft. The equipment is basically a radio receiver using a superheterodyne circuit with the addition of certain essential circuits necessary for radio compass operation and requires 15 tubes. Two remote controls are provided, and, although only one remote control functions at one time, control may be readily switched from one to the other. The frequency range of the equipment is 200 to 1750 kc which is covered in three bands, calibrated in kilocycles as follows: band 1 - 200 to 410 kc, band 2 - 110 to 850 kc, and, band 3 - 850 to 1750 kc. Only the frequency band in use is visible on the tuning scale. The equipment is manually tuned from either of two remote positions, and the bands are switched electrically from the position having control. When installations are made using only one remote control, no switching of control is necessary and the one radio control box used has control at all times. When used in conjunction with a suitable non-directional (vertical) antenna, one or two headsets, a 14- or 28-volt dc supply, a 115-volt, 400-cycle power supply, and necessary interconnecting wiring, Radio Compass SCR-269-A (or-C) is a complete operable unit capable of providing: (a) automatic bearing indication of the direction of arrival of radio frequency energy and simultaneous aural reception of modulated radio frequency energy: (b) aural reception of modulated radio frequency energy using a non-directional (vertical) antenna; (c) aural reception of modulated radio frequency energy using a loop antenna; (d) aural-null directional indications of the arrival of modulated radio frequency energy using a loop antenna. The Radio Compass SCR-269-C, in addition to performing the same function as Radio Compass SCR-269-A, has provision for aural reception of unmodulated radio frequency energy in each of the four cases. Selection of either type of reception is made by use of the "C.W.-VOICE" switch. All component parts of this equipment having the same type numbers are interchangeable, viz., radio compass units, loops, loop cords, indicators, and control boxes. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1020. ANONYMOUS, "Marconi Direction Finder Type 579/354N," Hydrographic Rev., vol. 15, p. 121; 1938. ABSTRACT: Description of a small crossed loop and goniometer type of system. The article compares in a non-technical manner the practical advantages and disadvantages of crossed loop and rotating loop systems. (a-6, b-1, c-1, d-1, e-0, f-Description)

1021. ALPERT, J. L., MIGULIN, V.V., ANDRYASIN, P. A., "On the Dispersion of Electromagnetic Waves above the Earth's Surface," Comptes Rendus Acad. Sci. URSS, vol. 18, no. 9, pp. 635-638; 1938. See also Wireless Engineer, vol. 15, p. 444; 1938. ABSTRACT: Measurements, using a "dispersion radio-interferometer" on the principle suggested by Mandelstam and Papalepi, took place over various kinds of land and over open seas. Distances ranged up to 18.6 km. Over the former, a dispersion of the order of a few tenths of a percent is possible; over the latter, the possible dispersion (if any) is less than 0.07%. Several experiments were carried out with the ship hidden behind land, which have shown that the appearance of land on the propagation path of radio waves exerts a definite influence on the phase difference of the oscillations at the receiving point. The data do not allow conclusions to be drawn on whether these phase variations were due to dispersion or to some other phenomena. (a-6, b-1, c-3, d-3, e-0, f-Descriptive analysis)

1022. BERNDORFER, F., "Direction-Finding Receiver Klein Z. E. Type 63/34," Deutsche Luft. Jahrbuch, vol. III, p. 66; 1938. ABSTRACT: The comment is a brief description of the above receiver with illustrations. (a-3, b-3, c-4, d-4, e-0, f-Description)

1023. DIECKMANN, M. AND BAERNER, K., "Investigations of Radio Bearing Loops Mounted inside of Metal Aircraft," Deutsche Luft. Jahrbuch, vol. 3, pp. 59-62. See also Department of Commerce PB24670; 1938. ABSTRACT NO. 1: An attempt was made to install loops inside instead of outside of airplanes in order to overcome aerodynamic disadvantages of the latter and to control the reception spectrum. It is shown how practical results can be obtained. ABSTRACT NO. 2: This report of the "Drahtlostelegraphische und Luftelektrische Versuchsstation Gräfelfing," concerns the transfer of the radio bearing loops normally located on the exterior, to the interior of the aircraft, in order to remove the aerodynamic disadvantage of the exterior loop as well as compensate for the quadrantal error corrector. The practical conditions are indicated under which bearings can be taken with interior loops. A photograph, diagrams, and graphs are included. (a_1-6, a_2-3, b-3, c-4, d-4, e-0, f-Description)

1024. FELDMAN, C. B., "Principles of Musa," Bell Laboratory Record Communications, vol. 16, p. 148; 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1025. GOLDBERG, H., "Design and Construction of Hertz Radio Compass System," Zeit. f. Fernmelde-technik., vol. 19, p. 38; 1938. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1026. GOLDBERG, H., "The R-9 Aircraft Direction-Finding Receiver," Elect. Comm., vol. 16, p. 373; 1938. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

1027. GROSSKOPF, J., SMITH-ROSE, R. L., HOPKINS, H. G., DIAMOND, H., NORTON, K. A., WATSON-WATT, R. A., MARCONI, G., ET AL., International Sci. Radio Union Proceedings, vol. 5, no. 1; 1938. ABSTRACT: Papers presented in Venice and Rome, Sept. 1938: Interference from mutual modulation in ionosphere, J. GROSSKOPF; Wave indicator of maximum precision, H. HEINZE; Behavior of Habann tube as negative resistance, F. W. GUNDLACH; Noise in vacuum tubes, F. B. LLEWELLYN; Fluctuation voltages in electric networks and thermionic tubes, E. B. MOULIN; Automatic measurement of atmospheric noise, K. MAEDA and H. YOKOYAMA; Ionization of high atmospheric regions and solar radiation, K. MAEDA; Ionospheric measurements during total solar eclipse of June 1936; Comparison of field strength of short waves received simultaneously in Japan from European stations, T. AMISIMA, L. YAMAGUTI, K. ENDO and M. NAKAGAMI; Theory of magnetrons with two plates, Y. ITO; Long period variations in F_2 region of ionosphere, K. TANI, Y. ITO and H. SINKAWA; Propagation of radio waves of frequencies of approximately 30 megacycles, K. MAEDA and T. TUKADA; Annual variations in high atmosphere, K. MAEDA, T. TUKADA and T. KAMOSHIDA; New theory of ionosphere, T. TUKADA; Investigating interaction of radio waves, E. V. APPLETON; Tides in upper atmosphere, E. V. APPLETON and K. WEEKES; Use of absolute frequency meters for scientific needs, JOUAUST; Measurement of intensity of electromagnetic field near antenna, C. GUTTON and F. CARBENAY; Measurement of radio field intensity, R. L. SMITH-ROSE; Studies of ionosphere during total solar eclipse of June 19, 1936, T. MINOHARA and Y. ITO; Measurement of height of ionosphere at Heilo, Manchuria, during total solar eclipse of June 19, 1936, T. NAKAMURA; Abnormal phenomena in transmission on short waves, D. ARAKAWA; Development of television in Japan, D. ARAKAWA, A. KOMPARA and T. AMISIMA; Metallic ellipsoid as stabiliser of centimeter waves, K. MORITA; Portable standard frequency generator, I. KOGA; Crystal oscillator for ultra-short waves, I. KOGA; Report to Commission I, E. H. RAYNER; Investigation of propagation of waves carried out in

Great Britain from July 1934 to June 1938, R. L. SMITH-ROSE; Radio direction finding on wavelengths between 6 and 10 m, R. L. SMITH-ROSE and H. G. HOPKINS; Limits of applicability of geometrical optics to study of particularly important case of propagation, D. GRAFFI; Effect of disturbances on propagation of radio waves in ionized gases, D. GRAFFI; Improvements in execution of frequency measurement, E. FUBINI-GHIRON and P. PONTECORVO; Solar activity and its influence upon earth, G. ABETTI; Preliminary measurements of F_2 region ionization, F. W. G. WHITE and C. J. BANWELL; Production of accurate one-second time intervals, W. D. GEORGE; Brightness of twilight sky and density and temperature of atmosphere to about 60 km, E. O. HULBERT; Peak field strength of atmospherics due to local thunderstorms at 150 megacycles, J. P. SCHAFER and W. N. GOODALL; Non-existence of continuous intense ionization in troposphere and lower stratosphere, O. H. GISH and G. H. BOOKER; Report to Commission I, PETRISH; Ultra-short-wave field strength measuring set, F. M. COLEBROOK and A. C. GORDON-SMITH; Comparison between theory and experimental date for ultra-short-wave propagation, R. L. SMITH-ROSE and A. C. STICKLAND; Measurements of lateral deviation of radio waves by spaced loop direction finder, R. H. BARFIELD and W. ROSS; Electron inertia effects in thermionic tubes, J. A. RATCLIFFE and S. KOWNACKI; Lorentz term in ionosphere theory, J. A. RATCLIFFE; Very long waves and lowest parts of ionosphere, J. A. RATCLIFFE and M. V. Wilkes; Abnormal phenomena in ionosphere at appearance of Aurora Borealis, W. DIEMINGER and H. PLENDL; State of ionosphere during Aurora Borealis of January 25 to 26, 1938, R. EYFRIG, G. GOUBAU, T. NETZER and J. ZENNECK; Surface radiation and antenna effect of closed aerials, L. SACCO; Surface radiation of horizontal antennas, G. LATMIRAL; Interference measurement of micro-waves, A. Lo SURDO, E. MEDI and H. ZANOTELLI; Thermic wattmeter for high frequency circuits, G. MAIONE; Application of graphs of maximum usable frequency to communication problems, N. SMITH, S. S. KIRBY and T. R. GILLILAND; Precise frequency control system for Station WIXJ, J. A. PIERCE; Possibilities of ultra-short waves for air navigation, F. A. KOLSTER; Determination of operating characteristics of power vacuum tubes, E. L. CHAFFEE; Tropospheric reflections of radio waves, R. C. COLWELL and A. W. FRIEND; Solar Radiation changes during sunspot cycle, E. V. APPLETON and R. NAISMITH; Characteristics of ionosphere throughout half sunspot cycle, N. SMITH, T. R. GILLILAND and S. S. KIRBY; American magnetic character-figure CA in relation to communication problems, A. G. McNISH and H. F. JOHNSTON; Radio fadeouts at department of terrestrial magnetism of Carnegie Institution of Washington, L. V. BERKNER and H. W. WELLS; Electromagnetic waves in free space, in metal pipes, and in dielectric wires, G. C. SOUTHWARTH; Measurement of direct interelectrode capacitance of vacuum tubes, C. H. WILLIAMS and K. M. SOUKARAS; Photoelectric measurements of ultraviolet solar intensities in stratosphere transmitted from unmanned balloons, R. STAIR and W. W. COBLENTZ; Resistance and permeability measurements at ultra-high frequencies, P. D. ZOTTU; Radio Observations in Puerto Rico, G. W. KENRICK; Influence of grid focusing effect on plate dissipation limit of vacuum tube, I. E. MOUROMTSEFF; Spontaneous fluctuations of current and potential, C. J. BAKKER and B. van der POL; Report of Sub-Committee 3 of Commission III, R. BUREAU; Frequency measurements carried out by Control Center of EIAR at Sesto Calende, L. SPONZILLI; Propagation of synchronized waves and reception of stations operating at same wavelengths, S. BERNETTI; Stability and instability in electric circuits, R. EINAUDI; Researches of origin of atmospherics, H. NORINDER; Ionosphere disturbances associated with solar activity, J. H. DELLINGER, S. S. KIRBY, T. R. GILLILAND and N. SMITH; Ground conductivity measurements in Canada, K. A. MacKINNON; Observations on skywave transmission on frequencies above 40 Mc/s, D. R. GODDARD; Exponential transmission line, C. R. BURROWS; Accuracy of radio field intensity measurements at medium frequencies, H. DIAMOND, K. A. NORTON and E. C. LAPHAM; Recombination in ionosphere, E. V. APPLETON and J. SAYERS; Electromagnetic horn radiators, W. L. BARROW; Random fading of 50 Mc signals over non-optical paths, K. C. MacLEAN and G. S. WICKIZER; Effects of ionosphere storms on radio transmission, S. S. KIRBY, N. SMITH and T. R. GILLILAND; Electromagnetic waves in elliptical metallic tubes, L. J. CHU; Radio Wave Propagation, J. H. DELLINGER; British work on Atmospherics, R. A. WATSON-WATT; Direction finding of atmospherics, R. A. WATSON-WATT; Theory of cylindrical radiating conductor, P. BAUDOUX; Velocity of phase, of power, and of both in ionized medium, J. Van MIEGHEM; Report to Commission on Radiophysics, B. van der POL; Critical frequency method of measuring upper ionospheric ionization, E. V. APPLETON, R. NAISMITH and L. J. INGRAM; Velocity of propagation of microwaves in proximity of earth's surface, A. Lo SURDO and G. ZANOTELLI; Interaction of radio waves - II, B. van der POL; Magnetic storms and upper atmospheric ionization, E. V. APPLETON and L. J. INGRAM; Report of Ionospheric Sub-Commission of Commission II, E. V. APPLETON and R. NAISMITH; New type magnetron for ultra-short waves, H. CHIREIX; Ionospheric eclipse of 1940 October 1, H. M. Nautical Almanac office; Measurements made at PTR 12/13 Mar. 1935, GIEBEN; Radio disturbances during polar lights of January 25, 1938 in Switzerland, J. LUGEON; Ionospheric research of G. MARCONI Radio Experimental Center at Torrechiaruccia, A. BOTTINI; Organization on fading studies, JOUAUST; Multiple directive antennas, V. GORI; Progressive Wave Directive Antenna, V. GORI; Short Wave receiving antenna, type G. A. NIUTTA; Statistical data on rapid total fading, Malnome receiving station; Ultra short wave transmission and atmospheric irregularities, C. R. ENGLUND, A. B. CRAWFORD and W. W. MUMFORD; Precise frequency measurements, E. MONTUSCHI; Measurement of speed of propagation of micro-waves along surface of ground, V. SAVELLI, Box type receiving aerials, R. KOCH; Calculation of starting phenomena in transmission apparatus, G. GIORGI; Relations between solar phenomena and wave propagation, R. JOUAUST; Limits between which approximate methods of geometric optics remain valid in field of wave optics and its application to radio waves, C. MANNEBACK; Apparatus for measurement of heights of ionized regions in high atmosphere, V. SAVELLI; Radioatmospheric research in Italy from 1913 to 1938, M. PAOLONI; Production of ionospheric regions E and F and lower altitude ionization causing radio fadeouts, O. R. WULF and L. S. DEMING; Solar effects on radio reception at broadcast frequencies, H. T. STENTSON; Ionosphere during morning twilight, E. O. HULBERT. (a-3, b-1, c-1, d-9, e-0, f-Various papers read)

1028. HARMENING, E., AND BEUERMANN, W., "Direction-Finding with 3 Meter Waves," (German) Deutsche Luft. Jahrbuch, vol. 3, pp. 63-65. See also Department of Commerce PB24671; 1938; Engineering Index, p. 327; 1939. ABSTRACT NO. 1: The article gives the results of experiments made to determine the suitability of ultra-short waves for D/F. ABSTRACT NO. 2: This is a report of the "Deutsche Versuchsanstalt for Luftfahrt E.V., Berlin-Adlershof" which discusses the experiments for testing the suitability of ultra short waves for direction finding purposes. It was also studied if the reception can be performed with various aircraft models at alternating altitude and at various hours of the day. Photographs and graphs are included. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

1029. KEEN, R., "Wireless Direction Finding," Wireless World, 3rd Edition, Iliffe and Sond, London; 1938. ABSTRACT: 803 pages of illustrations, diagrams, charts and tables; manual on direction finding, dealing with wave propagation, and direction finding theory relation to modern ground, marine and aircraft installations, including descriptions of actual systems in use. Bibliography. (a-3, b-6, c-1, d-5, e-0, f-See 2nd edition, Abstract No. 427 and 4th edition Abstract No. 2722)

1030. KHESIN, E. N., "On Calculating the Sensitivity of a Radio Direction Finders," Isv. Elektroprom. Slab. Toka., no. 10, pp. 37-41; 1938. See also Wireless Engineer, vol. 16, p. 90, Feb. 1939. ABSTRACT: It has been found experimentally that for a modulating frequency of 1000 cps the received signal in a D/F is distinguishable above background noise of the signal voltage is 5 times the background noise. On the basis of this information, formulas have been derived determining respectively the coefficient of sensitivity of a D/F and the swing necessary to determine a bearing. The accuracy of the formulas have been checked experimentally. (a-6, b-1, c-2, d-2, e-0, f-Descriptive theory)

1031. KIEBITZ, F., "From the Early History of Wireless Directional Telegraphy, Expecially as Regards Direction-Finding," Telefunken, vol. 19, p. 5; 1938. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1032. LOHMANN, G., "Use of an Adcock Aerial for Ultra Short-Wave Direction Finders," Rev. Gen. d'El., vol. 44, p. 34; 1938. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

1033. McPETRIE, J. S., "The Reflection Coefficient of the Earth's Surface for Radio Waves," JIEE, vol. 82, p. 214; 1938. ABSTRACT: Curves are given from which, by two interpolations, the reflection coefficient of the ground can be determined for any angle of incidence or any value of dielectric constant and conductivity of that surface. Curves are given for the two cases in which the electric vector of the incident radiation is polarized in and perpendicular to the plane of incidence respectively, so that the reflection coefficient can also be determined for any state of polarization. (Paper uses esu units) (a-1, b-1, c-1, d-1, e- , f-Descriptive theory and analysis)

1034. ROBERTS, H. W., "Some Design Combinations in Adcock Direction Finder," Aero Digest, vol. 32, pp. 52, 54, 60; 1938. ABSTRACT: Review of current installations, with particular attention

to Adcock antennas. (a-3, b-2, c-1, d-1, e-0, f-Review)

1035. ROCARD, Y., "Improvements in Radio Direction-Finder Apparatus." Rev. Gen. d'El., vol. 42, 1938. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

1036. SCHOGOLEV, E. J., "Radio-Interference Distance Meters and Some Results of Distance Measurements Obtained under Actual Conditions," Bull. Acad. Sci. URSS Ser. Phys., no. 4, pp. 551-572; 1938. See also Wireless Engineer, vol. 16, p. 416, 1939. ABSTRACT: The reflecting station was equipped with devices for maintaining perfect synchronism between the direct and returned waves. Distances measurements up to 114 km over the sea showed that their accuracy did not depend on distance. The rms error (from a series of 4-10 measurements, each taking 5-6 minutes) was 100-300 m, no dependence of the accuracy on meteorological conditions, time of day, or season, was found. (a-6, b-1, c-3, d-3, e-0, f-Descriptive evaluation)

1037. SIMON, "Lear A.R.C.-6 Automatic Radio Direction Finder," Can Aviation, vol. II, p. 18; 1938. ABSTRACT: Not available. (a-4, b-2, c-1, d-7, e-0, f-0)

1038. SIMON, "The Simon State-Free Radio Direction Finder," American Aviation, vol. 1, p. 16; 1938. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0

1039. SPERRY GYROSCOPE COMPANY, "An Automatic Direction Finder and the 'Flightray' Multiple Indicator," Communications, vol 18, p. 10; 1938. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

1040. STAFF OF THE RADIO RESEARCH SECTION, "A Short-Wave Cathode-Ray Direction-Finding Receiver." Wireless Engineer and Exper. Wireless, vol. 15, p. 432; 1938. ABSTRACT: Describes a 2-channel phase and amplitude-balanced receiver for use on frequencies from 4.3 to 10 mc (later extended to 20 mc). This is one of the first truly instantaneous D/F's (Watson-Watt type) and so far the most accurate. (a-6, b-1, c-1, d-5, e-0, f-Description)

1041. TUKADA, T., "A Cathode Ray Goniometer-Direction Finding," (German, from Japanese) See: Department of Commerce PB 54671, 1938. ABSTRACT: This article presents a practical evaluation of short wave direction finding with the use of a cathode ray goniometer and a H-Adcock Antenna. (a-3, b-3, c-4, d-4, e-0, f-Evaluation)

1042. TUKADA, T., "Ground Wave Radio Direction Finder with Cathode Ray Tube," (German) See: Air Document Index No. R2724 F875; 1938. ABSTRACT: Not available. (a-4, b-0, c-4, d-4, e-0, f-0)

1043. VAN HANDEL, P. and KRUGER, K., "Radio Navigation in Aircraft," E.T.Z., vol. 59, p. 684; 1938. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1044. ANONYMOUS, "Computation of Angle of Incidence of Long-Range Directional Beam," (German: L.H.S.) See: Air Document Index No. R2813 F1098; January, 1938. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1045. ELSNER, R., AND KRAMAR, E., "Direction Finder in Air," Wireless World, vol. 42, p. 53; January 1938. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

1046. KRAMAR, E., AND HAHNEMANN, W., "Ultra-Short Wave Guide Ray Beacon and Its Application," Proc. IRE, vol. 26, pp. 17-44; January 1938. ABSTRACT: Proceeding from the present state-of-the-art of air navigation in the United States and in Germany, the ultra-short wave instrument landing system in Europe is described. The fundamental principle and the technical improvements are mentioned and practical statements and views are given. Mention is made of the experience gained in the operation of the beacon. The conditions of inversion of the signals one into the other to avoid clicking are stated. The occurrence of split beams is dealt with. Their causes are explained and advice as to how to avoid such trouble is given. In the operation of neighbouring beacons, disturbed zones will occur which, by choosing the proper frequency spacing and the proper selectivity of the receivers, may be restricted to such an extent that they will not impair the use of radio beacons in any way. These problems are discussed more in detail. At first the propagation of ultra-short waves is treated on the basis of the theory of combining reflexion and diffraction on the earth with respect to their application to long range navigation. It results that, for a fixed distance and flying height, an optimum wave length range exists allowing the airplane to cover ranges of 250 km and more. The investigation of propagation results in the possibility of long range navigation by means of ultra-short wave beacons. The experiments made in Australia gave very encouraging results. Examples are given for producing four beams in any desired direction and for introducing the landing beacon in the long range navigation system. Finally the properties of an ultra-short wave system of navigation are considered in comparison with the use of long wave beacons. It becomes evident that the ultra-short wave system offers a number of advantages which seem to make it worth while to treat this problem earnestly. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

1047. ANONYMOUS, "Improvements in the Marconi-Adcock Radio-goniometer," Assoc. Suisse Elect., Bull. No. 29, pp. 19-21; 12 January 1938. ABSTRACT: The Marconi-Adcock system is in general accurate, but subject to brief aberrations. At night certain errors are more likely, due to imperfect reflexion from the ionosphere, variations in the direction of the incident wave, interference from neighbouring structures, and antenna errors. By improvements in the aerial system, feeders, and goniometer equipment, and the use of higher selectivity, an increase in sensitivity of about 22 db over earlier installations has been achieved. Short waves give good results only with distances exceeding 250 km; medium waves are received by ground wave, reducing night errors for short distances. High earth conductivity and the absence of wave front distortion due to neighbouring buildings are essential for good results. Earth resistance variations cause differences in the effective height of the aerials, producing errors in direction. These may be compensated by use of auxiliary aerials. (a-3, b-1, c-3, d-13, e-0, f-analysis)

1048. BARFIELD, R. H., AND ROSS, W., "Improvements in the Marconi-Adcock Direction Finder," Bull. Assoc. Suisse Elect., vol. 29, p. 21; 12 January 1938. ABSTRACT: Not available. (a-4, b-1, c-3, d-13, e-0, f-See preceding abstract)

1049. HEER, O. "Direction-Finding Arrangements for Safety of Aviation," V.D.I., vol. 82, pp. 66-67; 15 January 1938. ABSTRACT NO. 1: The term "Reichsflugsicherung" includes all the devices at present in Germany for ensuring the safety of aircraft, such as D/F equipment installed either on aircraft or at ground stations, and blind-landing equipment. This paper is concerned solely with D/F installations. Descriptions are given of typical aircraft apparatus and of the equipment at some ground stations. The latter includes ultra short-wave apparatus designed to assist landing in bad weather and comprises a system of 3 dipoles fed from a 0.5 kw transmitter with a frequency of 33.3 mc. The frequency is quartz-crystal controlled and modulated at a frequency of 1150 cycles/sec. ABSTRACT NO. 2: The term "Reichsflugsicherung" includes all the devices at present in use in Germany for ensuring the safety of aircraft, such as direction finding apparatus installed either on the aircraft themselves or at ground stations, blind landing equipment, night landing illumination, and aerodrome illumination. The present paper is concerned solely with the direction finding installations. Descriptions are given of typical aircraft apparatus and of the equipment at some ground stations. The latter includes ultra-short wave apparatus designed to assist landing in bad weather and comprises a system of 3 dipoles fed from a 0.5 kw transmitter with a frequency of 33.3 mc/sec, which is quartz controlled and modulated at a frequency of 1150-. The aircraft receiver contains a h.f. stage, an audion, and one or two l.f. stages with amplitude limitation. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

1050. COBURN, I. M., "Navigation by Wireless: How Direction-Finding Bearings Are Applied," Wireless World, vol. 42, p. 92; February 1938. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

1051. LEHMANN, G., "Explanation of the Principle of an Automatic Radio Direction Finder," Genie Civil, vol. 112, p. 136; February 1938. See also Wireless Engineer, vol. 15, p. 225; 1938. ABSTRACT: The system described consists of a rotating loop (5-10 rps) and an amplifier which transforms the signals into unidirectional sinusoidal alternations, the second derivative of whose minima give sharp peaks which fire a thyratron. The thyratron is automatically quenched whenever the loop passes the E-W direction. A bearing is thus given by the mean thyratron current. (a-6, b-1, c-3, d-3, e-0, f-Description)

1052. ANONYMOUS, "Radio Direction Finder in Navigation," (German: Telefunken) See: Air Document Index No. R2272 F691 P-32-F2-A-4353-46; March 1938. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0).

1053. BUSIGNIES, H., "Reduction of Night Error by the Use of Adcock Antennas," Onde Elect., vol. 17, pp. 106-127/195-210; March, April 1938. ABSTRACT NO. 1: Abnormal wave polarization during night produces an error in a loop-type D/F system. Description of an Adcock system and effect of polarization. Description of the new installations at Gordeaux. ABSTRACT NO. 2: After summarising the causes of night error and discussing the errors given by a frame aerial, the principle of the Adcock system is explained and it is then shown how the Adcock system may be used to give reduced night errors. A description is then given of radiogoniometers RC6 and RC6A and the paper concludes with a full account of the installation and working of radiogoniometer outfits RC6A at Bordeaux-Mérignac and at Norrköping (Sweden), also of radiogoniometer outfit RC/B, which is of the semi-fixedtype employing the Adcock aerial system and transportable, with all the necessary power supplies, by motor van. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Description)

1054. COLBERG, H., "Aircraft Radio Compass," Zeit. f. Fernmeldeterhmk, vol. 19, pp. 38-40; March 1938. See also Science Abstracts, vol. 41B, p. 434; 1938. ABSTRACT: A description, with illustrations and circuits, of a motor-drive radio-compass in which a loop antenna gives a continuous indication of the bearing of the axis of the aircraft with a chosen radio station. The control is effected through the incoming signal controlling a two-phase generator which rotates the receiving loop. (a-1, b-1, c-4, d-4, e-0, f-Description)

1055. FAIRCHILD, LePAUTE, AND De BHOZAS, "Avoidance of Night Effect in Radio Direction Finding," Revue d. Armee d. Air., vol. 104, p. 342; March 1938. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

1056. HANSEN, W. W., AND J. H. WOODYARD, "New Principle in Direction Antenna Design," Proc. IRE, vol. 26, pp. 333-345; March 1938. ABSTRACT: It is shown that in certain types of directional antenna arrays the gain can be increased by arranging so that waves going from the array elements in the direction of maximum transmission are not strictly in phase at large distances. Three examples are given, an end fire array and two antennae designed to radiate, as far as possible, only in a horizontal plane. In the case of the end fire array it is shown that readjustment of any existing antenna according to the ideas proposed here will increase the gain by about 1.8. The other two examples correspond to the kind of directivity generally desired in a broadcast antenna. One of these consists of short antennae placed in concentric rings. A typical array of this type containing 22 short antennae with the radius of the outer ring equal to 1.39λ has a gain of 2.31 as compared with 1.56 for a vertical half-wave antenna. The other example of a horizontally radiating array consists of a single ring of short antennae. An example of this type is calculated which has a gain of 2.0 with a total of 23 antennae placed in a circle with a radius of 1.43λ. These figures are not given as the best that can be done, but only as examples. (a-1, b-1, c-1, d-1, e-0, f-Descriptive theory)

1057. KRUEGER, "Radio Compass with Systems 77 Flug 128a, Compass Drive 77 Flug 140a," (German: S.A.M.) See: Air Document Index No. R2091 F833; March 1938. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1058. COBURN, I. M., "Special Maps for Use with Loop Direction Finders," Journal Aero Sci., vol. 5, p. 233; April 1938. ABSTRACT: Not available. (a-4, b-1, c-1, d-0, e-0, f-Maps)

1059. ECKERSLEY, T. L., "A Wireless Interferometer," Nature, vol. 141, pp. 369-370; February 1938. See also Wireless Engineer, vol. 15, p. 271; May 1938. ABSTRACT NO. 1: Use of pair of spaced-loop antennas for determination of spread in direction of scattered rays: reflection of sporadic echoes from irregular, high-density patches in E-region. ABSTRACT NO. 2: In a recent communication in Nature, the use of a pair of spaced frame aerials for locating the position of the scattering clouds in the E layer of the ionosphere was described. The system, has another function, which is also of importance in the investigation of scattering, namely, the determination of the spread in direction of the scattered rays. In the presence of a single ray, the EMF's in the two aerials are definitely related in phase and amplitude, and so it is possible by varying these quantities in the central circuit completely to balance the output of the system. When, however, there are many rays of random direction and phase forming a spread pencil or cone of independent rays, the setting for any one ray differs from that of the others, and all the rays cannot be balanced simultaneously. It is no longer possible to obtain a complete balance since the EMF's in the two aerials are not exactly correlated. There is a certain random diversity effect which increases as the frames are spaced farther apart. It is possible to calculate the degree of correlation between the EMF's in the two aerials when it is assumed that the EMF arises from rays of random phase and direction within a cone of angular aperture ϕ_0, the distribution being

$$Ae^{-\phi^2/\phi_0^2}$$

The correlation coefficient r is then approximately $r = 1 - \left(\frac{2\pi d}{\lambda}\frac{\phi_0}{2}\right)^2$,

so long as $\left(\frac{2\pi d}{\lambda}\frac{\phi_0}{2}\right) \ll 1$. With such a correlation coefficient, it is also possible to calculate the ratio of the residual EMF at the best obtainable balance to the EMF of one aerial alone. This ratio is

$$\frac{u}{v} = \frac{2\pi d}{\lambda}\frac{\phi_0}{\sqrt{2}}$$

and becomes unity, that is, there is no effective balance at all, when $\pi d\phi_0/\lambda = 1/\sqrt{2}$. It will be observed that except for a numerical factor of the order of unity depending on the distribution function of intensity within the pencil of rays, this is exactly the Michelson interferometer formula relating the angular diameter ϕ_0 of a pencil of rays to the observed mirror spacing d at which the contrast ratio in the fringes disappears. Thus the pair of spaced frames constitutes a wireless Michelson interferometer, the frames taking the place of the mirrors and the ratio u/v corresponding to the fringe intensity ratio. In the radio technique, the spacing is left constant but the contrast ratio measured. In the astronomical technique, the distance d is varied until the contrast ratio is unity. The same quantity, namely, the angular spread, is, however, measured in both cases. Observations have been made during the past year to measure the angular spread of the rays relfected from the ionosphere. Two salient facts emerge: The first is, that whereas for local ground signals balances, that is u/v ratios, of 1/1,000 or less can be obtained, it is very rare for a reflected signal from the ionosphere to give a better balance than about 1/30, with 20-m frame spacing, and the balance is usually of the order of 1/10, giving a spread of the order of 1° or 2°. The second is that the behaviour of the short scattered echoes (from heights of 100 km) is in complete contrast with that of the normal echoes from the E or F layer (indicating a completely different mechanism of reflection). Whereas the latter all give a quite well-defined balance, it is almost impossible with 20 m spacing to find any balance at all on the former, except on rare occasions. With 6 m aerial spacing, the balance is broad and ill-defined, with a minimum-maximum ratio of 1/2 to 1/3 implying angular spreads of the order of 30°. Thus the spaced aerial system, used first as a direction indicator and secondly as an interferometer, indicates, in both cases, that the sporadic short-scatter reflections are of an entirely different character from the normal E and F reflections. Both the results imply that the sporadic echoes are not reflected from a uniform E layer, but from high density patches in the E region, which are irregularly distributed both in time and in space. (a_1-6, a_2-1, b-1, c-1, d-5, e-0, f-Theory)

1060. EVANS, C., "Radio Direction Finder with RDF Loops on Patrol Aircraft," USN, Naval Air Station, San Diego, California; 13 May 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1061. ANONYMOUS, "The Aurora-Borealis and Direction Finding," Hochf: tech. u. Eleck: akus., vol. 51, pp. 205-206; June 1938. See also Wireless Engineer, vol 15, p. 517; September 1938. ABSTRACT: Description of aurora and abnormal conditions observed in short-wave direction finding. (a-6, b-1, c-4, d-4, e-0, f-Experimental analysis)

1062. BLUCKE, R. S., "The Practical Use of Radio as a Direct Aid to the Landing Approach in Conditions of Low Visibility," Journal Roy. Aero. Soc., vol 32, pp. 483-500: Disc. pp. 500-511; June 1938. ABSTRACT: Object is to describe two well-known and well tested systems which simplify problem provided necessary radio equipment is available both on ground and in airplane. (a) Track beacon system, (b) radio compass system. (a-3, b-1, c-1, d-5, e-0, f-Description)

1063. HOLLOMAN, G. B., "Automatically Controlled Blind Landings," Soc. Automotive Engrs., vol. 42, no. 6; June 1938. ABSTRACT: Automatic landing involves not only control of direction

but also control of altitude, engine control, 'Slow Cruise' control, 'let down' control, and further engine control after landing; review of tests carried out; various landing systems in use. (a-3, b-1, c-1, d-1, e-0, f-Blind landing control)

1064. JACKSON, W. E., "Status of Instrument Landing Systems," Proc. IRE, vol. 26, pp. 681-699; June 1938. ABSTRACT: During the past ten years a large number of instrument landing systems have undergone development and tests and a considerable fund of information has been accumulated concerning the shortcomings and advantages of each. The major airlines of the United States, the Federal Communications Commission, the Bureau of Air Commerce, and the Sub-Committee on Instrument Landing Devices of the Radio Technical Committee for Aeronautics have reached an agreement as to the fundamental elements which should be incorporated in a practical instrument landing system and have also outlined a programme of projected development. Having this agreement, it is now possible for all interested organisations to proceed with the perfection of a practical system by combining the superior features of the systems which have been tested and to carry on development which will further augment this system. At present, the major airlines are planning to install a number of instrument landing systems, having the fundamental elements agreed upon by the above mentioned organisations, to be used on an experimental and pilot-training basis. It is recommended that the Bureau of Air Commerce sponsor further development of instrument landing equipment until it meets the approval of all concerned with regard to operation, reliability, and ease of maintenance, as well as fundamental elements. When this condition is reached, it is recommended that the Bureau of Air Commerce purchase, install, and operate a number of these instrument landing systems at various airports throughout the United States on an experimental basis. (a-1, b-1, c-1, d-1, e-0, f-Survey-landing systems)

1065. KOSCHMIEDER, K., "The Lorenz Long-Wave U-Adcock Direction Finder," Lorenz Berichte, vol. 1/2, pp. 41-53; June 1938. See also Wireless Engineer, vol. 15, p. 516; September 1938. ABSTRACT: Its development from the H-system: the "coupled" U, and the "balanced and coupled" U systems; use of insulated earth mats; results on trailing antennas. (a-6, b-1, c-4, d-4, e-0, f-Description of antenna system)

1066. NORGORDEN, O., AND MEYER, R. B., "A Study of the Radiation Characteristics of Shipboard Antenna Systems," USN, NRL Report No. R-1448; June 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

1067. BARFIELD, R. H., AND ROSS, W., "The Measurement of the Lateral Deviation of Radio Waves by Means of a Spaced-Loop Direction Finder," JIEE, vol. 83, pp. 98-110; July 1938. ABSTRACT NO. 1: Description of four-fixed-loop equipment: its performance; proof of lateral displacement of amount depending on range and type of reflected waves; effective points of reflection at ionosphere may be 50 - 100 kilometers off of great circle path. ABSTRACT NO. 2: The design and working of an experimental direction finder of the fixed, four spaced-loop type is described, and tests show that the instrumental errors do not exceed 2°. The bearings of Zeesen, Nauen, Prague, certain American stations, and of Dorchester, with wavelengths between 30 and 50 m, are investigated with the direction finder in conjunction with a cathode-ray goniometer. From more distant stations, lateral deviations up to 20° were recorded, while for Dorchester, distant 100 km, the deviation sometimes amounted to 50°. It appears that the effective points of reflexion at the ionosphere may be 50 to 100 km out of the great circle path. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Analysis)

1068. SMITH-ROSE, R. L., AND HOKINS, H. G., "Radio Direction-Finding on Wavelengths between 6 and 10 Metres (Frequencies 50 to 30 Mc/Sec)," JIEE, vol. 83, no. 499, pp. 87-97; July 1938. See also Wireless Engineer, vol 15, p. 573; October 1938. ABSTRACT NO. 1: The paper describes the development of simple experimental direction-finders for wavelengths between 6 and 10 metres, and their use in an investigation of the accuracy of direction-finding on these wavelengths. It is shown that the inherent accuracy of the instruments is well within the limits of ±2°, while their sensitivity is sufficient for observation on an experimental 50-watt transmitter at ranges up to 22 miles over flat ground. Bearings have also been taken on signals emanating from London television transmitters, blind-landing beacons, and also from commercial and amateur transmitting stations some 3000 miles away. Detailed experiments have shown that the site on which the direction-finder is used must be clear of obstacles, particularly trees and vertical wires, for a radius of at least 50 to 100 yards; and there are indications that similar conditions are necessary for the site of the transmitter. When such conditions are satisfied, the bearings observed at distances up to 22 miles from the transmitter may be in error by as much as 8°, although in the majority of cases the error was less than 2°. Such errors tend to diminish in magnitude as the range increases, and they may or may not be affected by small changes in position of the direction-finder, by changes in frequency of the transmitter, or in the orientation of the transmitting aerial. For a given set of conditions the changes to bearings observed from day to day do not exceed about 2° for ranges of 20 miles, although in some long-distance observations made on signals from American stations at a range of 3000 miles the variations in bearings were much larger. A brief study has been made of the behaviour of the loop direction-finder when horizontally polarized waves are emitted at the transmitting station. It is shown that the errors experienced in this case can be almost entirely eliminated by the use of a rotating spaced vertical aerial arrangement in place of the loop. The evidence resulting from the use of this Adcock type of direction-finder indicates that the errors with the loop set are due to the reception of horizontally polarized waves. ABSTRACT NO. 2: Descriptions are given of two experimental direction finders, one a rotating loop and the other an Adcock type spaced aerial device, both being designed for use with wavelengths between 6 and 10 m. During tests of the inherent accuracy of the instruments, it is found that obstacles such as trees, wires, etc., within a radius of 100 yds of the direction finder can affect the apparent bearing; and there is indication that the transmitter also should be in open ground. If these requirements are fulfilled, bearings are generally correct to within 2°. The Adcock type with vertical aerials has the advantage that it is almost unaffected by horizontally polarised waves. (a_1-1, a_2-3, b-1, c-1, d-5, e-0, f-Description)

1069. ANONYMOUS, "The Adcock Direction Finder Equipment 174N and 233N," (German: Telefunken) See: Air Document Index No. R2218 F872; August 1938. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1070. BUDENBOM, H. T., "Proper Spacing between Units of Differential Antenna Pairs in Direction Finding for the Case of a Multi-Ray Signal - Extension of Memorandum of October 22, 1937," Bell Telephone Laboratory, New York City, Memo No. 1938-311-HTB-KL; 9 August 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

1071. BARFIELD, R. H., "An Elevated Transmitter for Testing Direction Finders," Wireless Engineer, Vol. 15, pp. 495-498; September 1938. ABSTRACT NO. 1: A 70-foot tower with transmitter raised on pulleys and automatically contacting radiators. A useful device for direction finder testing. The author gives several restrictions on applications of elevated antennas for testing. ABSTRACT NO. 2: The measurement of the extent to which a radio direction finder is subject to polarisation error is most satisfactorily achieved by taking bearings on downcoming waves of known angles of incidence and polarisation. This paper gives a description of an apparatus used at the Radio Research Station, Slough, for this purpose, consisting of a low power transmitting source with a dipole aerial erected at the top of a tower, 70 ft high. The aerial is rotatable so that waves of any desired polarisation can be obtained. This installation is suitable for use on wavelengths below 70 m at which the minimum useful angle of incidence is 80 deg. With wavelengths of 15 m and below, it is possible to work with angles of incidence of 45 deg. or less, while still retaining the requisite distance of two wavelengths between transmitter and receiver. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

1072. COLEBROOK, F. M., "Application of Transmission Line Theory to Closed Aerials," JIEE, vol. 83, pp. 403-414; September 1938. ABSTRACT: The paper contains an analysis of the behaviour of frame aerials consisting of a single turn of conductor. It is assumed that the mutual interactions of the various elements can, to a useful degree of approximation, be represented by the differential equations of classical transmission line theory. Formulae are obtained for the effective induced emf and the effective impedance at the tuning point of frame aerials, the dimensions of which are not small compared with the wavelength, both for symmetrical and asymmetrical systems of tuning. It is shown that the "resonant factor" of a frame aerial can be determined by the usual method of reactance variation at a constant frequency in spite of the non-uniformity of the current distribution along the length of the conductor, but the same process carried out by variation of frequency will not, in general, be valid. A method of applying the formulae to circular loops by a process of integration is given and illustrated by particular cases. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

1073. GORDON, R. A., "Test of Model DV Direction Finder Equip-

ment, Serial No. 5, Submitted by Bendix Radio Corp," USN, NRL Report No. R-1475; September 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1074. SHONECK, "Auxiliary Direction Finding Equipment for Radio Installation FuG XXI," (German: Telefunken) See: Air Document Index No. R2274 F901; September 1938. ABSTRACT: Not available. (a-4, b-3 c-4, d-4, e-0, f-0)

1075. ANONYMOUS, "Report of Committee on Radio Wave Propagation," Proc. IRE, vol. 26, pp. 1193-1234; October 1938. ABSTRACT: Summary of the principle facts of radio wave propagation throughout the radio spectrum in concise form for use by practical engineers. The frequency divisions are (A)Medium frequency (ground wave) 150-1500 Kc, (B) Medium frequency (sky wave) 150-1500 Kc, (C) High frequency 1500-30,000 Kc, and (D) Ultra-high frequency 30 Mc. Curves of field intensity versus distance, MUF, best frequencies for day and night propagation, effects of the earth's magnetic field, ground conductivity, season of the year, protection effected by directive antennas, affect of height and diffraction. (a-6, b-1, c-1, d-1, e-0, f-Survey)

1076. GOLDMAN, S., "Shielded Loop for Noise Reduction in Broadcast Receivers," Electronics, vol. 11, pp. 20-22; October 1938. ABSTRACT: An unshielded loop has a directional pick-up on the loop itself and also acts as a vertical aerial. The provision of a shield, connected to the receiver chassis, practically eliminates the vertical aerial effect. In one type of shielded coil, the coil is located inside a metal tube, which is cut through at one point and the ends joined by insulating material. In a second type the screen takes the form of a cylinder with metal end plates, the curved sides of the cylinder consisting of a coarse mesh in which the vertical threads are wire and the horizontal ones are non-conducting fibres. All the metal wires are connected to the top metal disc, but only one wire to the bottom disc. In this way a coil of good quality is obtained, since the closed circuits parallel to the loop are reduced to a minimum. A loop of 21 turns, 10.5 inches high and 7.5 inches in width was found to be about as sensitive as a good indoor aerial and could be tuned with a condenser tracking with the oscillator, no earth connexion being necessary. (a-3, b-2, c-1, d-1, e-0, f-Description)

1077. CORDON, R. A., "Test of Model DW Ratio Direction Finder Equipment Submitted by the Bendix Radio Corp.," NRL Report R-1487; October 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Equipment test)

1078. LEVY, L., "A New Direct-Reading Radio Direction Finder," Onde Elec., vol. 17, pp. 469-472; October 1938. ABSTRACT: Description of a system which compares the phase of the received signal with the phase of a fixed signal produced in the aircraft. A phase meter gives the bearing directly. The system is usable for either fixed or mobile installations. (a-6, b-1, c-3 d-3, e-0, f-Description)

1079. MAEDA, K., AND NISHIKORI, K., "Direction-Finding of Very Short Radio Waves of 20 - 50 Megacycle Range," Report of Radio Research in Japan, vol. 8, pp. 77-90. Air Force, Air Document Index No. R2799 F121; October 1938: See also Wireless Engineer, vol 16, p. 147; March 1939. ABSTRACT NO. 1: Adcock antenna system with receiving apparatus raised 3.5 meters: special care in design of feeders; some results. ABSTRACT NO. 2: Apparatus for waves of from 20 to 50 mc. and measurements made by means of apparatus; Adcock antenna system used, and receiving part that is attached to antenna stood at height of 3.5 m above ground, so that it could be rotated around wooden shaft. (a_1-6, a_2-3, b-1, c-1, d-6, e-0, f-Description)

1080. JONES, B., "New Direction Finder - Robots Are Getting Smarter," U.S. Air Services, vol. 23, no. 11, p. 24; November 1938. ABSTRACT: New development carried out jointly by Sperry Gyroscope Co. and RCA Manufacturing Co.; most important improvement noted is automatic functioning of bearing indicator, which, if airplane is also equipped with gyropilot, permits human pilot to entrust airplane to automatic devices entirely. (a-3, b-3, c-1, d-1, e-0, f-Description)

1081. SMITH, S. B., AND HATCH, J. F., "Errors in Radiogoniometers," Marconi Review, no. 71, pp. 9-15; October, December 1938. ABSTRACT: Note describes a few of the most common errors encountered in practice and indicates methods for measuring their magnitude. Methods are not restricted only to high frequency measurements; greater accuracy is obtainable in the 1.5 to 20 Megacycle band. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

1082. ANONYMOUS, "Suggested Homing Procedures When Using Direction Finders, Types RDF-1A, RDF-1B, RDF-2, RDF-2A, RDF-4, and Models DU, DV, and DW," USN, Bureau of Aeronautics, Technical Note No. 40-38; 28 October 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1083. ANONYMOUS, "Collection of Diagrams of Ground Radio Sets," (German: Telefunken) See: Air Document Index, no. R2096 F574; November 1938. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1084. ANONYMOUS, "Committee on Aircraft Radio," Lilienthal-Gesellschaft für Luftfahrtforschung, Berlin, Report No. 3; November 1938. ABSTRACT: This document is a report on the session of the Committee on Aircraft Radio of the Lilienthal Society for Aviation Research held November 11 and 12, 1938 at Oberpfaffenhofen. It contains the text and discussion of the following papers presented by the members of the Committee: Report on experiments and flights with low-altitude meters; The present state of electroacoustic echo-sounding meters; Important of technical auxiliary devices for vertical navigation in air transportation; Short report on the "Rechlin" altimeter method, New developments in the electric altimeter according to the pulse method; State of direction finding by rotating ratio beacon lights; Short report on experiences with the "Rechlin" rotating radio beacon and possibilities for its future development; and Electric self-excitation of aircraft hulls (Aircraft as radiator). Drawings, photographs and diagrams included. (a-3, b-3, c-4, d-4, e-0, f-Report)

1085. BERNDORFER, "Goniometer for a Revolving Beacon with Improved Localizer Beam," (German) See: Air Document Index, No. R2709 F851; November 1938. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1086. ANONYMOUS, "D/F and Communication on Short Waves in Connection with Aircraft," Admiralty Signal Establishment (British) Report No. M.309; December 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1087. ANONYMOUS, "Factors Controlling D/F on Wavelengths of 14 - 200 Metres," Admiralty Signal Establishment (British) Report No. M.311; December 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1088. ANONYMOUS, "Lear ARC-6 Automatic Radio Direction Finder," Can. Aviation, vol. 11, no. 12, p. 18; December 1938. ABSTRACT: New direction finder to be used in conjunction with Learadio compass and communication receiver, briefly described. (a-3, b-2, c-1, d-7, e-0, f-Description)

1089. ANONYMOUS, "Marconi Adcock D/F (Type DFG12)," Admiralty Signal Establishment (British) Report No. M.310; December 1938. ABSTRACT: Not available. (a-4, n-3, c-1, d-5, e-0, f-0)

1090. ANONYMOUS, "Short Wave Marconi Adcock D/F Station - Type DFG.12," Admiralty Signal Establishment (British) Report No. M.313; December 1938. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1091. HOPKINS, H. G., "Loop Direction Finder for Ultra-Short Waves, Wave Range 6-11 Meters," Wireless Engineer, vol. 15, pp. 651-657; December 1938. ABSTRACT: The paper describes an ultrashort wave direction finder of the rotating loop type incorporating a supersonic heterodyne receiver and suitable for use at a fixed station or in the field. The direction finder has a higher order of instrumental accuracy, and the reciprocal error is about 0.1° over the band 8-10 m (27-38 Mc/sec) for which the receiver is designed. Means of extending the wave range of the receiver down to 6 m are indicated. The sensitivity of the system is high and under favourable conditions a bearing with a swing of ±5° is obtainable on a vertically polarised emission of field strength 2 μV/m. Under suitable conditions bearings can be observed with a swing as small as ±0.1°, but bearings so obtained are seldom correct to this high order of accuracy. (a-3, b-1, c-1, d-5, e-0, f-Equipment description)

1092. TUKADA, T., "A Cathode-Ray Goniometer-Type Direction Finder," Report of Radio Research in Japan, vol. 8, pp. 125-133; December 1938. See also Wireless Engineer, vol. 16, p. 519; October 1939. ABSTRACT: Modification of Watson-Watt design one-dial control of the three receivers. Test oscillator dispensed with by calibrating with signal emf from the vertical antenna, after amplification. (a-6, b-1, c-1, d-6, e-0, f-Modification description)

1093. GORDON R. A., "Test of Model DU Direction Finder Equipment, Submitted by Bendix Radio Corp.," USN, NRL Report No. R-1502; 22 December 1938. See Department of Commerce PB120388. ABSTRACT: 46 Page report including tables, graphs, drawings, etc. (a-3, b-3, c-1, d-1, e-0, f-Test report)

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1094. ANONYMOUS, "Bendix MN-26 Direct-Reading Radio Compass and Direction Finder," Bendix Aviation Corporation, Baltimore, Maryland; 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1095. ANONYMOUS, "Engineering Description 102A, 103A, 104A Direction Finders," Federal Telecommunication Laboratories, Nutley, New Jersey; 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1096. ANONYMOUS, "Instruction Book for Navy Model DAB-3 Radio Direction Finder Equipment," Collins Radio Company, Cedar Rapids, Iowa; 1939. ABSTRACT: The Navy model DAB-3 radio direction finding equipment consists of one spaced loop and receiving equipment including indicators designed for amplitude comparison operation. The equipment covers the range of 2 to 18.1 mcs. The bearing indication is described as a phase comparison (although actually it is an amplitude comparison) of the signals received at the two loops. This comparison is made on a cathode-ray tube indicator. It is stated in the instruction manual that in order for the equipment to respond to a rotation of ±1° from the on-bearing position, the signal strength required ranges from 15 microvolts per meter at 2 mcs to 1 microvolt per meter at 18 mcs. Each loop of the spaced loop assembly is tuned with components at the loop feed point. Since the crossover connection between the loops is in effect the indicator system, it is necessary to provide a two channel receiver which functions as a matched of twin channel receiver. Each of the loops is approximately 5'11" wide and is spaced 16 ft apart. The receiving equipment is mounted on the short mast at the center of rotation. The equipment is designed for calibration signal injection to equalize the gain of the two receiver channels with a differential and an overall manual gain control. The frequency of the signal which is fed into the injection loops is manually adjusted so that it differs by 1000 cycles from that of the incoming signal. (a-4, b-3, c-1, d-1, e-537, f-Instruction book: see Abstract No. 1229)

1097. ADDEY, F., "Calculation of Great Circle Bearings," Journal P.O. Elect. Eng., vol. 32, p. 142; 1939. ABSTRACT: Not available. (a-4, b-1, c-1, d-0, e-0, f-0)

1098. COLE, R. I., "Errors in Closed-Loop Direction Finders," Paper presented at the 1939 Annual Convention of the Institute of Radio Engineers, New York City. ABSTRACT: Coastal refraction errors are described. (a-4, b-9, c-1, d-1, e-0, f-Description)

1099. DEVEREUX, F. L., "Yacht D.F. Set Long Wave Receiver for Weather Forecasts and Position Finding," Wireless World, vol. 45, p. 164; 1939. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

1100. FINK, D.G., "An Automatic Direction Finder: The Flight Ray Multiple Indicator," Communications, vol. 18, pp. 10, 22; 1939. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1101. FLEMING, J. A., Terrestrial Magnetism and Electricity, Edited by J. A. Fleming, McGraw-Hill Book Co., Inc., 794 pp., illus., diagrs.; 1939. ABSTRACT: A compilation of all the known facts concerning the physics of the earth's interior, surfaces, and outer atmosphere. Considerable information is given on theories of earth magnetism and earth currents; also, theories and data on the ionosphere and auroral manifestations are given. (a-6, b-6, c-1, d-1, e-0, f-Survey)

1102. FRAMME, R. J., "Aero-Compass Company Differential Direction Finder," Aero Digest, vol. 34, p. 98; 1939. ABSTRACT: Not available. (a-4, c-2, c-1, d-1, e-0, f-0)

1103. FRAMME, R. J., 'Fairchild Direction Finder," Aero Digest, vol. 34, p. 101; 1939. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1104. FRAMME, R. J., "Lear-Davis Direction Finder," Aero Digest, vol. 34, p. 98; 1939. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1105. FRAMME, R. J., "Lear-Davis Gyromatic Direction Finder," Aviation, vol. 38, p. 420; 1939. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, d-0 f-0)

1106. GLOECKNER, M. H., AND HAUENSCHILD, E. V., "Radio Direction Finding Error in Mountainous Areas," (German: D. V. L.) See: Department of Commerce PB24510; 1939. ABSTRACT: This is a report of the "Deutsche Versuchsanstalt für Luftfahrt, E. V., Berlin-Adlershof, Institut für Elektrophysik." This article discusses experiments performed in the Alps in order to explain the special propagation phenomenon of radio waves in mountainous areas. The so-called "Mountain effect" consists mainly of reflection effects of mountains. Direction finders using loop and Adcock antenna systems indicate approximately the same amount of deviation when bearings are taken on air-borne transmitters using vertical substitute dipole antennas. The effect of inclined polarized reflections on loop direction finders is also discussed. (a-3, b-3, c-4, d-4, e-0, f-Experiment)

1107. GONSHARSKI, L. A., "The Use of a Cathode-Ray Oscillograph in an Inductor Tele-Compass," Auto. and Telemech., vol. 36, pp. 85-96; 1939. See also Wireless Engineer, vol. 17, p. 412; 1940. ABSTRACT: A brief description is given of an inductor-type course-indicating device. The induction principle is utilized to give actual compass readings, which are observed on a cathode-ray oscillograph. The theory of the system is described, and it is pointed out that the bearings given are free from errors due to airplane inclination. Advantages and disadvantages of the system are discussed. (a-6, b-1, c-2, d-2, e-0, f-Description)

1108. HEER, O., "Aircraft Direction-Finding," Communications, vol. 18, p. 33; 1939. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

1109. HOPKINS, H. G., "A Loop Direction Finder for Ultra-Short Waves," Wireless Engineer and Experimental Wireless, vol. 15, pp. 651-657; 1939. ABSTRACT NO. 1: Describes an ordinary loop with a battery powered rf stage attached. The above unit rotates through 360°; the i.f. signal is taken from slip rings. The audio output signal comes back to the rotating unit through slip rings so the operator can turn with the loop, always facing the controls. Adjustable collars on the shield of the loop at the gap provide a novel adjustment for loop symmetry. The wavelength is 6 to 11 meters. ABSTRACT NO. 2: The paper describes an ultrashort wave direction finder of the rotating loop type incorporating a supersonic heterodyne receiver and suitable for use at a fixed station or in the field. The direction finder has a high order of instrumental accuracy, and the receiprocal error is about 0.1° over the band 8-10 m (27-38 Mc/sec) for which the receiver is designed. Means of extending the wave range of the receiver down to 6 m are indicated. The sensitivity of the system is high and under favourable conditions a bearing with a swing of ±5° is obtainable on a vertically polarised emission of field strength 2 μV/m. Under suitable conditions bearings can be observed with a swing as small as ± 0.1°, but bearings so obtained are seldom correct to this high order of accuracy. (a_1-6, a_2-1, b-1, c-1, d-5, e-0, f-Description. Note: Science Abstracts dates publication December 1936.)

1110. LEUTZ, C. R., "Directional Reception: A 'Steerable' Short Wave Aerial," Wireless World, vol. 46, p. 25; 1939. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

1111. LYUBCHENKO, I. U., "Method of Measuring the Phase Difference between Two Frequencies in Simple Numerical Ratio, Particularly for Distance Determination by Interference Method," Journ. Tech. Physics U.S.S.R., vol. 9, p. 563; 1939. See also Wireless Engineer, vol. 17, p. 116; 1940. ABSTRACT: The article discusses circuits which can be used for measuring the phase difference between two waves whose frequencies have simple numerical ratio, an impor-

tant application of which is the determination of distance. The natural frequency of three types of back-coupled tube circuits is adjusted by varying R, L, and C of the tuned anode circuit. An external EMF is applied to the circuit; the EMF has two components whose frequencies bear a numerical ratio. Then non-linear differential equations of second order with periodically-varying coefficients are derived determining the operation of the system. Solutions for special cases are given. (a-6, b-1, c-2, d-2, e-0, f-Description)

1112. MARIQUE, J., "Automatic Radio Goniometers," Wireless Engineer, vol. 16, p. 121; 1939. ABSTRACT: An analytical discussion of "carrier suppression" due to rotation of loop or goniometer. Treats the importance of amplifiers capable of causing same gain and phase shift on both of the sideband frequencies. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

1113. RISTAU, H., "Demonstration of the Various Methods of Radio Direction Finding with Small Short-Wave Emitter," Zeit. f. techn. Phys., vol. 19, p. 444; 1939. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1114. SMITH-ROSE, R. L., "Investigation in Great Britain on Behavior of Direction Finding Installations," U.R.S.I. Proc. of 1938 Assembly Fasc. 1, vol. 5, p. 41; 1939. ABSTRACT: Not available. (a-4, b-1, c-3, d-14, e-0, f-0)

1115. SMITH-ROSE, R. L., "Symposium on Direction Finding; Introductory Remarks," JIEE, vol. 85, pp. 203-212; Discussion: pp. 212-214; 1939. ABSTRACT: Dr. Smith-Rose introduces six papers (individually cited earlier) along with descriptive critique pertaining to each. The papers were read before the Wireless Section on March 1st, 1939 and are as follows: R. H. Barfield and R. A. Fereday: "An Improved Medium-Wave Adcock Direction-Finder," JIEE, 1937; R. H. Barfield and W. Ross: "A Short Wave Adcock Direction-Finder," JIEE, 1937; R. L. Smith-Rose and H. G. Hopkins: "Radio Direction-Finding on Wavelengths between 6 and 10 Metres (Frequencies 50 to 30 Mc/sec)," JIEE, 1938; R. H. Barfield and W. Ross: "The Measurement of the Lateral Deviation of Radio Waves by Means of a Spaced-Loop Direction-Finder," JIEE, 1938; R. A. Fereday: "A Sense-Finding Device for Use with Spaced-Aerial Direction-Finders," JIEE, 1939; W. Ross: "The Calibration of Four-Aerial Adcock Direction-Finders," JIEE, 1939. (a-4, b-1, c-1, d-5, e-870, f-Critical analysis)

1116. SODEN, D. V., "The Erroneous Indication of Goniometer Type Direction Finding Systems of Large Dimensions," (German) F.F.O., See: Department of Commerce PB24507; 1939. ABSTRACT: This is a report of the "Flugfunk-Forschungsinstitut Oberpfaffenhofen." The present work discusses calculations which show how large the diameter of a goniometer type direction finder system can be so that the error will not surpass a certain amount. Graphs are included. (a-3, b-3, c-4, d-4, e-0, f-D/F error)

1117. WIRKLER, W. H., "Diversity Errors in Fixed Antenna Direction Finders," Collins Radio Company, Cedar Rapids, Iowa; 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Errors)

1118. ANONYMOUS, "List of Drawings of Marconi-Adcock D/F Equipment - Type DFG. 12," Admiralty Signal Establishment (British) Report No. M. 314; January 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Bibliography-D/F systems)

1119. ANONYMOUS, "Preliminary Description and Operating Instructions of the Airborne Goniometer and Direction Finding Equipment: F1 Bordpeilander Baumuster Peil 5.," (German); January 1939. See Department of Commerce PB L85369. ABSTRACT: Equipment operates on 400-1000 kc for long distance and 165-400 kc for short distance reception. Wiring diagrams and photos included. (a-4, b-3, c-4, d-4, e-0, f-Description)

1120. ANONYMOUS, "Preliminary Description and Instructions for the Airborne Direction Finding Set. Building Model No. Peil 5.," (German: G. L. Z.) See: Department of Commerce PB L70534; January 1939. ABSTRACT: This report is an operational training manual for the airborne direction finding set building Model Peil 5 used in air navigation. The abstract was prepared by Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Instructions)

1121. ANONYMOUS, "Special Radio Report. HF D/F Tests Thirteenth Naval District," U.S. Navy Yard, Puget Sound, Washington Report No. RS3A452A; January 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1122. ALFORD, A., "High Frequency Transmission Line Networks," Elect. Comm., vol. 17, pp. 301-10; January 1939. ABSTRACT: By high frequency transmission line networks will be meant those networks which are installed along feeders of high frequency transmitting and receiving antennae for the purpose of performing a variety of services, such as matching of impedances of antennae and feeders, separation of frequencies, filtering of harmonics, control of phase, division of power, etc. While some of the functions of these networks can be carried out with networks built up of lumped inductances and condensers, it has been found more practical to employ networks made of sections of transmission line of the same constrction as the feeder themselves. The latter types of networks are preferable not only because they are, generally speaking more rugged and more likely to remain in proper adjustment when exposed to the elements, but also because their performance, in the usual case, may be calculated with greater accuracy and the parameters on which their electrical properties primarily depend are linear dimensions which may be measured on the job, in feet and inches with steel tape, more simply and more accurately than the inductance of a coil or the capacity of a condenser in weatherproof housings could be measured under the same circumstances. Transmission line networks made up of sections of transmission line may be subdivided into two groups, namely, those in which sections of line are used as impedances and those which are built up of "re-entrants." To the first group belong such familiar networks as the so called building-out sections, quarter wave shorts, etc. To the second group belong networks made up of 're-entrants," which will be discussed in the present paper. The transmission line network, referred to as a re-entrant network, or simply re-entrant, is shown in Figure 1. This network consists of two sections of transmission line joined at their ends in such a way as to form a closed loop. If one of the two sections, for instance A B, is designated as the main transmission line or feeder, while the other line A C B is called the branch, then the branch line starts or brances off at some point A of the main line and rejoins or re-enters the same line at some other point B. Hence the name re-entrant. The electrical properties of a re-entrant network depend primarily on the lengths of the two limbs of the network expressed in terms of the wavelength, electrical degrees or radians; that is, on the electrical lengths θ_1 and θ_2 of the two limbs of the network. The secondary parameters of the network are the attenuation coefficients (γ) of the waves travelling along the limbs of the network, the angles at which the branch line joins with the main line, the relative geometrical dimensions of the network and the spacing between the conductors of the transmission line. In practice it is ordinarily sufficient to make most of the calculations on the basis of the two primary parameters, namely, θ_1 and θ_2, and to take account of attenuation only when investigating the regions in which the network behaves as a filter or when it is required to find the losses in the network. The effect of angles at which the branch line meets the main line is treated as a correction which usually is so small as to be negligible. Finally the effect of radiation interaction between the various wires of the network is usually also negligible since the spacing between the line conductors is ordinarily quite small in comparison with the dimensions of the network. (a-1, b-2, c-1, d-1, e-437, f-Theory)

1123. BARROW, W. L., AND LEWIS, F. D., "The Sectoral Electromagnetic Horn," Proc. IRE, pp. 41-50; January 1939. ABSTRACT: An electromagnetic horn radiator, two of whose opposite sides are flared, the other two being parallel, was studied experimentally at wavelengths between 40 and 100 cm. For comparison, measurements on parabolic reflectors and broadside arrays were also made. By virtue of its unusual freedom from secondary lobes and stray radiation, its ability to operate well over a broad band width, its simple construction, and its ease and stability of operation, the electromagnetic horn offers unique possibilities as a directive radiating system for microwave applications. These results and the application to a straight line blind landing system for airplanes are discussed. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

1124. FALLOON, "Visual Reading Direction Finder for Rotating Spaced-Frame or Other Aerial System," Marconi Rev., no. 72, pp. 45-46; January, March 1939. See also Wireless Engineer, vol. 16, p. 147; March 1939. ABSTRACT: The system uses a cathode-ray tube whose deflection system revolves with the loop system, giving maximum deflection with zero signals. (a-6, b-1, c-1, d-5, e-0, f-Description)

1125. FEREDAY, R. A., "A Sense-Finding Device for Use with Spaced-Aerial Direction Finders," JIEE, vol. 84, pp. 96-100; January 1939.

See also Wireless Engineers, vol. 16, p. 199; April 1939. ABSTRACT NO. 1: A D/F device particularly suitable for high frequencies and cathode-ray-tube receivers: sense determined with help of second observation with changed electrical connections. ABSTRACT NO. 2: A simple method is described for the rapid determination at a receiver of the sense of the direction of arrival of the radiation from any transmitting station. A radio bearing of the station is taken in the usual manner with a four-aerial Adcock direction-finding system, and a second observation of minimum received signal is made after certain modifications to the electrical connexions between the aerials have been effected by switching. The two observations are sufficient to determine without the usual ambiguity of 180° the bearing of the transmitting station at the receiver. The method is particulary suitable for use on h.f. and with the visual type of receiver incorporating a cathode ray tube. (a_1-6, a_2-1, b-1, c-1, d-5, e-0, f-Description)

1126. SMITH, P. H., "Transmission Line Calculator," Electronics; January 1939. ABSTRACT NO. 1: The original description of the Smith Chart Developed at Bell Labs. ABSTRACT. NO. 2: Transmission line problems are greatly simplified if the line is terminated by an impedance equal to its characteristic impedance. Standing waves of current and voltage are then eliminated, and if losses are neglected, the input impedance, current, and voltage at all points along the line are constant. Computations for the current and voltage under these conditions are based simply on Ohm's law. In communication systems this special condition is usually considered most conductive of efficient trouble-free operation. There has long been a need for a simple means, without recourse to lengthy computations, for evaluating the impedance, current, and voltage at any chosen point along radio frequency transmission lines in terms of specific values of the several transmission line parameters. This has led to the development of a special radio-frequency transmission-line calculator for solving many ordinary transmission-line problems. There are four factors that generally enter the solution of problems involving the changing input impedance along a line. These are the characteristic impedance of the line, the load impedance, the length of the line, and the input impedance. If any three of these are known, the fourth may be found from the relationship:

$$Z_s = Z_o \frac{Z_r + jZ_o \tan 2\pi L}{Z_o + jZ_r \tan 2\pi L}$$

Where L is the length of the line in wavelengths, Z_o is its characteristic impedance, which for low-loss radio-frequency lines is essentially a pure resistance, Z_r is the load impedance, and Z_s is the input impedance. The independent variable Z_o will be a constant for an particular line, and consequently may conveniently be combined with Z_s and Z_r in the form of a ratio. With this transformation, the equation becomes:

$$Z_s/Z_o = \frac{Z_r/Z_o + j \tan 2\pi L}{1 + j(Z_r/Z_o) \tan 2\pi L}$$

For any one value of Z_r/Z_o substituted in this equation a series of values for Z_s/Z_o can be plotted for various values of L from zero up to one-half wavelength. Because L appears in the equation as an arc tangent, the curve will repeat itself for every half wavelength. If such a curve is plotted on a rectangular coordinate system with the resistance components along the abscissa axis and the reactance components along the ordinate axis, it will be found to be a circle with its center on the resistance axis. For other values of Z_r/Z_o other curves could be drawn, and all would likewise be found to be circles with their centers on the resistance axis, but they would not be concentric. Each of these curves, however, represents more than a single value of Z_r/Z_o. At the load end of the line, for example, where L = 0, Z_s will be equal to Z_r, which determines one point on the curve. Obviously every other point on the curve corresponds to another value of Z_r, when L is taken as zero at that point. This other value of Z_r, when substituted in the above equation, will give the same curve but with a different position for the point of L = 0. These curves, therefore, cannot be completely designated by a single value of Z_r/Z_o. It will be noted, however, that each curve gives a minimum and maximum value of Z_s/Z_o which are the two points where the curve crosses the resistance axis. The ratio of the minimum to the maximum value of Z_s/Z_o, which is the same as the ratio of minimum to maximum Z_s, is different for each curve, so that each may be designated by the ratio of minimum to maximum input impedance that is peculiar to it. Each circle thus represents the input impedance over a half wavelength section for a family of transmission lines of various values of characteristic and load impedances, but alike in having the same ratio of minimum to maximum impedance. The ratios of minimum to maximum current or voltage will also be the same for any transmission line represented by a single curve, and may be designated by ρ, and these values of ρ are marked on the curves. (a_1-4, a_2-1, b-2, c-1, d-1, e-0, f-Transmission lines)

1127. WHEELER, H. A., "Transmission Lines with Exponential Taper," Proc. IRE, p. 65; January 1939. ABSTRACT: Exponential lines, like exponential horns, are useful as impedance-matching devices. They are best inserted in a high-pass filter having the same cutoff frequency determined by the rate of taper. Unusual rules are derived for inserting the lines in the filter with exact matching of iterative and image impedances. Design formulas are derived for the construction of exponential lines. A transmission line whose impedance varies exponentially along its length, has electrical impedance-matching capabilities similar to those of an exponential horn in acoustical impedance matching. Likewise, it behaves as a high-pass filter whose cutoff frequency depends only on the rate of exponential taper. Such a tapered line has apparent utility in matching an antenna (such as a horizontal doublet) with a uniform (nontapered) line of much lower impedance. This paper includes a collection of formulas which have been derived to express the electrical properties of the exponential line, and their relation to the mechanical dimensions. Increasing the rate of taper increases the cutoff frequency, reducing the useful range of frequencies. The iterative impedance above the cutoff frequency has a constant magnitude, but its resistive component is equal to the corresponding image impedance (resistance) of a constant-k high-pass filter. Therefore the exponential line can be inserted in such a filter as a device for matching different impedances. Rules and circuits are given for this use of the exponential line. Particular attention is given to the design of an exponential line comprising a pair of wires whose separation varies along their length. The method of design is described with reference to an example in which a straight-wire doublet is matched with a uniform transmission line. (a-1, b-1, c-1, d-1, e-0, f-Transmission lines)

1128. IMMLER, W., "Radio Direction Finding Evaluation," (German: R. L. M.) See: Department of Commerce PB20825, 5 pp; 1 January 1939. ABSTRACT: This document "Ringbuch der Luftfahrttechnik" presents a summary of methods for radio direction finding since its introduction. With the progress of direction finding distance, important consideration must be given to the consideration must be given to the spherical shape of the globe as well as to proper map projection. Also discussed are the various types of errors usually present in radio direction finding. Bibliography of 77 items are included. (a-3, b-3, c-4, d-4, e-0, f-Summary)

1129. ECKERSLEY, T. L., "Scattering of Wireless Waves in the Ionosphere," Nature, vol. 143, pp. 33-34; 6 January 1939. ABSTRACT: The salient facts of ionospheric scattering are: (1) at frequencies exceeding the critical, a pulse receiver shows characteristic scatter groups (S) of echoes from apparent height 80-300 km; (2) S echoes are not reflected vertically; (3) the least equivalent height of S depends on the frequency and approaches that of the second-order F_2 vertical reflection as the critical frequency is approached; (4) with a beam transmitter, energy is scattered back along the path of the beam; (5) S disappears when the frequency is so high that the ray tangential to the earth escapes through the F_2-layer. These facts may be explained by assuming that rays penetrate the E-layer obliquely, are reflected from F, and pass again through E. At the two points of penetration of E the rays meet scattering clouds, the further point of penetration accounting for the S echoes. There are no scattering clouds in F. (A-3, b-1, c-1, d-5, e-0, f-Analysis)

1130. GIULIETTI, G., "Special Direction-indicating Device of Luminous Type for Use with Inductor Compasses for Aerial Navigation," Elettroetecnica, vol. 26, pp. 10-11; 10 January 1939. See also Wireless Engineer, vol. 16, p. 306; June 1939. ABSTRACT NO. 1: Vibrating-reed, cathode-ray tube and RCA 6E5 electron-ray-tube types. ABSTRACT NO. 2: Three types of compass for aircraft navigation are described. All three depend on the generation of an emf by a coil rotating in the earth's field, this emf being used to provide a luminous indication of the correctness of the course. The first type is equipped with a form of reflecting galvanometer which throws a beam of light on a translucent screen: when the course is correctly set a stationary spot of light is seen. The second method employs Braun tubes and the indication of the course is the same as for the first. The third method employs electron ray tubes and the correctness of the course is indicated by the magnitude of the image on the screen. (a_1-6, a_2-3, b-1, c-9, d-9, e-0, f-Description)

1131. MC GILLIVRAY, J. A., "Automatic Navigator," Wireless World, vol. 44, pp. 76-78; 26 January 1939. ABSTRACT: The article describes the arrangement of two linked direction finders by means of which the position of an aircraft is shown by the intersection of a pair of pointers pivoted on a chart. (a-1, b-1, c-1, d-5, e-0, f-Description)

1132. BERNDORFER, "Direction Finder Using an Oscillograph Tube as an Indicator," (German: D. L. V.) See: Air Document Index No. R2739 F871; February 1939. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1133. KOCH, O. J., "Apparatus for Direction Finding in Aircraft," Funktech. Monatshefte, no. 2, p. 50; February 1939. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Description)

1134. NEFZGER, A., "Direct-Indicating Loop Direction Finder with Range Greater than 360°," (German) See: Air Document Index No. R234 F121; February 1939. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1135. WIRKLER, W. H., "Direction Finding System," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 101; 11 February 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1136. BARFIELD, R. H., AND PRESSEY, B. G., "The Development of the H-Adcock Direction Finder," National Physical Laboratory (British), Report No. RRB/C.4; 14 February 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Summary)

1137. MARIQUE, J., "Automatic Radiogoniometers," Wireless Engineer, vol. 16, no. 186, pp. 121-124; March 1939. ABSTRACT: Many radiogoniometers function with frame aerial turning continuously at certain speed, generally 5 to 19 rps; when these rotating frame arrangements are combined with high selective amplifiers; phenomena is noticed which forms subject of paper; method of measuring time constants of oscillating circuits. (a-3, b-1, c-1, c-5, e-0, f-Goniometers)

1138. MARIQUE, J., "New Visual Automatic Radio Direction Finder," Onde Elec., vol. 18, pp. 111-120; March 1939. ABSTRACT NO. 1: Description of a system using two shielded loops with a vertical sense antenna. ABSTRACT NO. 2: A new automatic radiogoniometer with visual indication; details, circuits and notes on installation and operation of radiogoniometer for ships, called "Radiogonioscope," (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Goniometers)

1139. SMITH-ROSE, R. L., "Accuracy of Direction Finders," Nature, vol. 143, p. 440; March 1939. ABSTRACT: An abstract of six papers on D/F which were presented before the Wireless Section of the IEE. The topics discussed include instrumental calibration, and the effect of disturbing objects between the D/F and the calibration transmitter. One of the papers was published in JIEE, November 1937. (a-6, b-1, c-1, d-5, e-0, f-Papers)

1140. ANONYMOUS, "Gyromatic D/F," Aviation, vol. 38, no. 4, p. 42; April 1939. ABSTRACT: Description of new compass by Ward Davis of CAA and Lear; combines the use of automatic "station seeking" radio duty on airport map and gyro compass of "airport orientator" type. The radio D/F is standard Lear type ARC-6 compass with motor driven loop. (a-4, b-2, c-1, d-1, e-0, f-Equipment description)

1141. KOCH, O. J., "Aircraft Navigational Equipment," (German: F. T. M.) See: Air Document Index No. R2716 F660; April 1939. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1142. PERROUX, G. M., "The LMT System of Blind Landing," Onde Elec., vol. 18, pp. 149-180; April 1939. ABSTRACT: An account of the principles employed in radio aids to the landing of aircraft in bad visibility, and a description of the LMT system employed by Air France. In this system the aeroplane, having been guided to the aerodrome by radio beacon, passes over a vertical beacon which gives the signal for descent. At this point which is at an altitude of about 300 m curves of constant radio field strength lead downwards to meet the landing ground tangentially. A suitable field distribution is secured by a special, horizontally polarised aerial system, and a safe landing results if the pilot descends so that the output meter of his special receiver shows a constant deflexion. Curves showing the trajectories of descent described in a large number of tests under various weather conditions are given. (a-3, b-1, c-3, d-3, e-0, f-Landing system)

1143. NUKIYAMA, D., IRISAWA, M., AND KOBAYASI, T., "On Direction Finders," Report of the Aero Research Institute, Tokyo Imperial University Report No. 176, vol. 14, pp. 151-190; May 1939. See also Wireless Engineer, vol. 17, p. 231; May 1940. ABSTRACT NO. 1: Experiments on ultra-short waves of about 5 meters: plotting (with small dipole-aerial measuring equipment) the field intensities and directions around various forms of conductors carrying oscillating currents; the characteristics of these radiators when used as direction finders. ABSTRACT NO. 2: The electric field round some forms of conductor carrying oscillating current was studied (wavelength of the order of 5 m). With a small electric doublet the electric field and direction were surveyed. The direction characteristic of the antenna is dealt with. (a_1-6, a_2-3, b-1, c-6, d-6, e-9, f-Experiments)

1144. ANONYMOUS, "The Radio Compass," Wireless World, vol. 44, p. 414; 4 May 1939. ABSTRACT: The article considers briefly D/F's available for navigational use up to 1939. It describes both single- and crossed-loop systems, and methods for mechanically driving the loop and for indication. These features combined, make the D/F more or less automatic. (a-6, b-1, c-1, d-5, e-0, f-Survey)

1145. ANONYMOUS, "Model DP-9 Radio Direction Finder Equipment, Frequency Range 100-1500 k.c., A.C. Operation," Radio Corporation of America, Instruction Book: IB 38032; 20 May 1939. See also Department of Commerce PB17409. ABSTRACT: These instructions cover the installation, operation and servicing of the direction finder equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the super-heterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The receiver for this equipment differs from the previous instruments by the addition of an antenna input protective relay and a neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use. The neon protective device bypasses high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. Other minor mechanical features have been improved. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1146. ANONYMOUS, "Model DP-10 Radio Direction Finder Equipment, Frequency Range 100-1500 k.c., A.C. Operation," Radio Corporation of America, Camden, New Jersey: Instruction Book, 20 May 1939. See also Department of Commerce PB17408. ABSTRACT: These instructions cover the installation, operation and servicing of the direction finder equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the super-heterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The receiver for this equipment differs from the previous instruments by the addition of an antenna input protective relay and a neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use. The neon protective device bypasses high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. Other minor mechanical features have been improved. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1147. ANONYMOUS, "Model DQ-3 Radio Direction Finder Equipment," Radio Corporation of America, Camden, New Jersey: Instruction Book No. IB38033; 20 May 1939. See also Department of Commerce PB17494. ABSTRACT: These instructions cover the installation, operation, and servicing of the direction finder equipment specified above. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the super-heterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. This equipment is similar to equipment furnished on previous contracts but differs in the following respects: the loop is transformer coupled to the receiver instead of directly connected to the loop tuning capacitor. The loop shafts for the equipments on this contract are furnished in four different lengths Each loop with a different shaft length bears a different Navy type number. Each loop has been properly aligned to the receiver with which it is shipped. Pedestals are not furnished by the manufacturer. The receiver for this equipment differs from the previous instruments by the inclusion of the receiver input transformer and the addition of an antenna input protective relay and a neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use. The neon protective device bypasses

high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. Other minor mechanical features have been improved. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1148. ANONYMOUS, "Model DZ Aircraft Radio Direction Finder Equipment, with Addendum for Model DZ-a Direction Finder Equipment," US Navy, Bureau of Ships, Instruction Book No. IB 38035-38035-1. See also Department of Commerce PB38364, June 1939. ABSTRACT: Model DZ direction finder equipment consists essentially of a rotatable loop antenna, a radio receiver, and a dynamotor-filter. The equipment is designed for operation from an aircraft's 12-volt battery and serves either for radio reception or direction finding. The loop antenna assembly consists of the loop antenna, the loop pedestal and the loop pedestal extension. The loop antenna incorporates two center-tapped loop windings enclosed within a nonmagnetic alloy housing together with a relay for the selection of the antenna winding necessary for operation on a given band. The loop is rotated for direction finding by means of a hand wheel on the loop mounting pedestal, the exact bearing indicated by means of an index and azimuth scale. The radio receiver is of the conventional superheterodyne type and covers, in six bands, frequencies between 15 kc and 70 kc and between 100 kc and 1500 kc. The dynamotor-filter unit converts DC power from the battery into 205 volt DC for operation of the receiver. The DZ-a equipment covered in the addendum differs very little from the DZ equipment, the principal difference being the dynamotor unit which is designed to operate from a 24-volt source instead of 12 volts. Photographs, diagrams, drawings, and parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1149. ANONYMOUS, "Model DZ-1 Radio Direction Finder Equipment," US Navy, Bureau of Ships, Instruction Book No. IB 38103. See also Department of Commerce PB38633; June 1939. ABSTRACT: Model DZ-1 direction finder equipment consists essentially of a rotatable loop antenna, a radio receiver, and a dynamotor-filter. It is designed for operation from an aircraft's 24-volt battery and serves either for radio reception or direction finding. The loop antenna consists of the loop antenna assembly and the loop drive assembly. The loop antenna assembly consists of two center-tapped, shielded loop windings contained within a streamlined, waterproof housing. One loop winding is mounted inside of the other and the two windings are so adjusted that their planes intersect at an angle of 90 degrees in order to prevent intercoupling. The inner winding is used for reception on frequencies between 100 kc and 1500 kc, the outer on frequencies between 15 kc and 70 kc. The two windings are rotated as a unit by a central shaft actuated by means of the loop drive assembly. The loop drive assembly consists of an azimuth scale, hand wheel and brake assembly, and the loop drive extension. Bearings are read by means of one of two indices and azimuth scales. The radio receiver employs the conventional superheterodyne circuit and covers the frequency range of the equipment in six bands. CW or MCW is received on the lower band and either phone or MCW is received on the higher band. The 205-volt DC potential required for the operation of the receiver is obtained from the dynamotor-filter unit operating from a 24-volt battery. This equipment is very similar to the Model DZ equipment (see PB38634) in most respects, except for the construction and operation of the loop antenna assembly. Diagrams, drawings and parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1150. DZIEWIOR, K., "Summary of Known Suggestions for Determination of Distance and for Reflected-Beam Direction-Finding by Wireless Means," Tuftfahrt. Forschung, vol. 16, pp. 326-338; June 1939. See also Engineer Index, p. 12; 1939. ABSTRACT: The article is a compilation of various radio methods for measurement of low, medium, and high altitudes. (a-6, b-1, c-4, d-4, e-0, f-Survey and bibliography)

1151. LEWIN, L., "Radiation Resistance of Horizontal Dipole above Earth," Marconi Rev. no. 73, pp. 13-24; April, June 1939. ABSTRACT: Calculation of radiation resistance of vertical antenna above earth was completed many years ago by van der POL; as far as author is aware, analysis for horizontal dipole above earth has never been carried to similar conclusion; expression for it was stated by McPHERSON, but no attempt was made to evaluate integral involved; expression for radiation resistance is given in form suitable for practical calculation. (a-3, b-1, c-1, d-5, e-0, f-Theory)

1152. ANONYMOUS, "U.S. Naval RDF Station, Klipsin Beach, Washington," USN, Naval Yards, Puget Sound, Report No. RS3A449A; 6 June 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1153. BUSIGNIES, H., "Mountain Effects and the Use of Radio Compasses and Radio Beacons for Piloting Aircraft," Proc. IRE; 27 June 1939. ABSTRACT: On the occasion of automatic radio compass demonstration made on one of the American Air Lines airplanes in New York and Washington, D.C., and during flights made between Sal. Lake City and Chicago on the "Flight Research Plane" of the United Air Lines, most interesting effects were noted in the combined use of radio beacons and radio compasses. These effects, including direction finding observations in the Rocky Mountains, form the subject of the present study. First, errors and fluctuations in the indications obtained with loop radio beacons and vertical antennae in direction finding are examined, and it is shown that the results of calculations are in accord with the phenomena observed. Then mountain effects are considered - reception on a directional loop aerial of a "direct" wave and of a "reflected" wave. It is shown that calculated results are in agreement with experiments made whilst flying across the Rocky Mountains, and the regular fluctuation in the bearing noted in the mountain effect is explained. Corresponding details are given with regard to similar observations made in Switzerland between Berne and Basle. A description follows of demonstrations of the mountain effect on a reduced scale by means of an ultra-short wave direction finder and a system of reflectors. Further, the observation of the "cone of silence," as well as the detection of flight above a station (broadcasting or radio beacon) by means of a radio direction finder or a radio compass is discussed. The paper concludes with remarks on the advantages of the radio compass and radio beacon combination as shown, for example, by the results of tests made in the United States. (a-1, b-1, c-1, d-1, e-48, f-Descriptive analysis)

1154. ANONYMOUS, "Instruction Book for Model DV Radio Direction Finding Equipment," U.S. Navy, Bureau of Engineers, Instruction Book No. 122. See also Department of Commerce, PB38637; July 1939. ABSTRACT: The model DV radio direction finding equipment has been designed to take accurate unilateral and bilateral bearings when used in conjunction with Navy radio receiving equipment of the RM series. It is intended for installation on the larger types of Naval aircraft such as patrol and transport planes, or in any plane which requires that the loop be remotely located and controlled from the radio compartment. Frequency range if from 220 to 1500 kc in three bands. Lists of major units, spare parts and manufacturers, photographs, drawings, and circuit, schematic and wiring diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1155. MAEDA, K., AND NISHIKORI, K., "Homing on Ultra Short Waves of 20 - 50 Mc," (German: from Japanese) See: Department of Commerce PB54097; July 1939. ABSTRACT: The document is a German translation of a Japanese document containing data on the development of a D/F ultra short wave station with an Adcock antenna for elimination of night effects. D/F for the ultra short wave range of 40 - 50 meg has increased in importance. However, to date, its technique has not fully developed. The rotating Adcock antenna can be used to an advantage in the 20 - 50 meg range. When constructing the antenna great attention must be placed on the electrical and mechanical properties of the conductors. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-1, c-4, d-4, e-0, f-Study)

1156. RANZI, I., "Recording D.F. for Atmospherics," Ricera Scientifico, vol 10, pp. 664-674, July, August 1939. See also Wireless Engineer, vol. 17, p. 123; March 1940. ABSTRACT: Narrow-sector apparatus with two receivers. Recording with loop and vertical antenna; and opposing, with loop only, at right angles to first. Both loops rotate on a common vertical axis once every half-hour. Recording by moving-coil oscillograph. (a-6, b-1, c-9, d-9, e-0, f-Experiment)

1157. SMITH-ROSE, R. L., "The Recent Trend of Radio Direction-Finding," Nature, vol. 144, p. 139; July 1939. ABSTRACT: The Direction-finder is an instrument for determing the direction of arrival of waves normally used in radio communication. Although introduced during the early years of the present century, it did not become a practical instrument until the receiver was developed and provided the necessary sensitivity. In its early form, the radio direction-finder, using closed loop aerials was applied as an aid to marine navigation, and as a means of locating the position of unknown transmitting stations; in addition, however, the instrument provided a useful tool in the study of propagation of electric waves. Arising out of these applications, it was noticed that under certain conditions of wave propagation and beyond certain minimum distances of transmission, the directional indications of the instruments were subject to large errors, which were due to the action of the horizontal components in the arriving waves. The remedy for this state of affairs was to be found in a British patent applied for by F. Adcock in 1918, in which it was proposed to replace the closed receiving loops by pairs of spaced vertical aerials,

so connected together that the resultant action of any horizontal components of electric force could be reduced to a negligible amount. The practical utility of this invention was demonstrated in 1926, and soon afterwards the Adcock direction finder became a commercial proposition for medium wave-lengths. This advance had the effect of increasing the range of usefulness of ground receiving stations to several hundred miles, at which distances polarization errors ranging up to 45° or more with the loop aerial were reduced to less than one tenth of this amount. Limitations of space have delayed the application of this improved direction-finding system on board ship, but the closed loop type used on medium wave-lengths has so far been found sufficiently accurate for the comparatively modest range requirements of marine navigation. Since 1930, two factors have had a major effect upon the trend of radio direction finding investigations. First, the growth of aerial transport has given rise to a demand for accurate radio bearings of aircraft at distances ranging up to several thousand instead of several hundred miles; and secondly, the general trend of radio communication to shorter and shorter wave-lengths has necessitated the extension of direction finding technique in a corresponding manner. For the particular case of aerial navigation, various radio beacons have been developed by which a pilot may be guided and enabled to land under conditions of poor visibility, but the scope of such aids is usally limited to comparatively short ranges, except in the case of long straight air routes, such as exist in the United States of America. In order to provide a useful radio-bearing service to aircraft at ranges between 200 and 2000 miles, it is necessary to resort to the use of short waves, so that the comparatively minute transmitter power available on the aircraft may produce sufficient field intensity at the ground receiving station. For this purpose, spaced aerial direction-finders have been developed to a high standard of performance for the wave-length band 10-100 metres. Such instruments are now available, with either a simple aerial receiver in which the bearing is determined by rotating a goniometer search coil to a zero or minimum signal position, or a dual receiver and cathode-ray tube indicator in which the bearing is read from a visual trace on the fluorescent screen. A detailed theoretical and experimental study of the principles of design and construction of such short-wave direction finders has led to the conclusion that their inherent instrumental accuracy should be of the order of 1°, with a maximum error values of 2° or 3° under the most severe conditions of reception of polarized waves. When such direction finders were used in practice, however, it was found that the observed bearings of transmitting stations in known positions were subject to errors much greater than this, sometimes ranging up to 10° or 20°. This raised the question as to whether the instrument was still defective due to some undetected fault, or whether the measurements indicated departures of the arriving waves from the great circle plane between transmitter and receiver. To assist in the resolution of this question, resort was had to a pair of identical vertical closed loops, spaced a fraction of a wave-length apart and symmetrically connected to the central receiver in such a manner that certain instrumental defects inherent in the use of open aerials can be eliminated. It is convenient to use a visual receiver of the cathode-ray tube type, and various tests have demonstrated that the inherent instrumental accuracy of such apparatus is somewhat higher than that previously attainable. When used for taking bearings the accuracy was not materially better than that hitherto obtained. It is to be concluded, therefore, that a severe limit is set to the accuracy of radio direction finding under certain conditions by vagaries in propagation. The direction finding instruments indicate the actual direction of arrival of the waves to a high order of accuracy, but this is not necessarily the direction of the transmitter, but rather that of the point of reflection or scattering of the waves from the ionosphere. It is perhaps fortunate that it is possible to avoid using the bearings obtained under such conditions, and increased knowledge and experience will soon indicate in precisely what circumstances it is safe to rely upon the radio bearings obtained. Meanwhile, the use of these short-wave direction finders is adding considerably to our knowledge of the mode of propagation of electric waves through the ionosphere. In the range of wave-lengths below 10 metres, direction finding is in the early stages of development, but instruments of the closed loop and spaced aerial types have already been used for ascertaining the possibilities of the art on wave-lengths down to 3 metres. It seems likely that within this wave-length band, some application is likely to be found in ascertaining the positions of radio sounding balloon transmitters at ranges up to one hundred miles or so. In this sphere, however, much more research is needed on the propagation of waves as well as on the design and construction of the direction finding instruments. (a-1, b-2, c-1, d-5, e-0, f-Abstract consists of essentially the complete paper)

1158. WIRKLER, W. H., "Theory and Preliminary Tests of Heterodyne Direction Finder with Visual Indicator," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 102, 22 July 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Experimental test report)

1159. HEER, O., "U and H Aerial Adcock Radio Direction-Finding Equipment for Aviation," V.D.I., vol. 83, pp. 878-880, 29 July 1939. See also Engineer Index, p. 327, 1939. ABSTRACT: A discussion of the advantage of the Adcock method over the impulse method at high interference levels. The two systems are compared in other respects and a detailed description of the Adcock system is given. (a-6, b-1, c-4, d-4, e-0, f-Evaluation)

1160. ANONYMOUS, "Instruction Book for Model DW Radio Direction Finding Equipment," U.S. Navy, Bureau of Engineers, Instruction Book No. 123. See also Department of Commerce PB39409; August 1939. ABSTRACT: Subject equipment has been designed to take accurate unilateral and bilateral bearings when used in conjunction with Navy radio receiving equipment of the RU series. Frequency range is 220 to 1500 Kc/s. This equipment is intended for installation on the larger types of Naval aircraft, such as patrol and transport planes, where the loop may be plugged into a shaft which extends directly up through the skin of the ship from the direction finder coupling unit in the radio compartment. This book contains detailed description of direction finding components and loop control and indicating mechanism, as well as instructions for installation, initial adjustment and calibration, operation, and maintenance. An appendix presents the following tables: list of major units, parts list by symbol designations, parts list by Navy type numbers, spare parts list, and list of manufacturer. Photographs and diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1161. HECHT, N.F.S., "Radio in Aviation: A General Survey, with Special Reference to the Royal Air Force," JIEE, vol. 85, pp. 215-237; Disc., 237-241; August 1939. ABSTRACT: This paper discusses the conditions peculiar to aircraft operation in respect of radio telegraphy and radio telephony. Particular stress is given to those conditions not usually met with in other applications of radio communication and especially to the sources of interference to reception and of danger to the aircraft and its occupants. It concludes with a brief reference to a few special applications of radio in aviation, and while no attempt is made to describe the equipment itself the fundamental principles on which its construction is based are briefly given. (a-1, b-1, c-1, d-5, e-0, f-Analysis and survey)

1162. ROSS, W., AND BURGESS, R. E., "Direction Finding Improvement in the Quality of Observations by Use of Non-linear Amplifiers," Wireless Engineer, vol. 16, pp. 399-401; August 1939. ABSTRACT: Describes a method of sharpening aural nulls, or maxima in D/F's by making the gain of the amplifier increase with increasing input (i.e. reverse a.v.c). This is for both increased contrast and sharpened null. (Note: by reversing the a.v.c., the author means not only polarity but also that the input to the bias-developing network must come from an amplifier ahead of the nonlinear amplifier). (a-6, b-1, c-1, d-5, e-0, f-Description and analysis)

1163. ROSS, W., "The Calibration of Four-Aerial Adcock Direction Finders," JIEE, vol. 85, pp. 192-202; August 1939. See also Wireless Engineer, vol. 16, p. 519; October 1939. ABSTRACT NO. 1: Determination of closest range of test transmitter for avoidance of "proximity" errors (between 0.6λ and 3.5λ in most practical cases): mathematical treatment, practical application of results. ABSTRACT NO. 2: The paper describes how it is possible to determine the minimum radius at which a four-aerial Adcock direction finder may be calibrated for instrumental error without introducing spurious effects due to the proximity of the calibrating transmitter to the direction finder. It is shown that this minimum radius depends upon the spacing of the aerials, the wave-length, and the inherent accuracy of the direction finder to be calibrated. In most cases of practical interest the minimum radius is found to be between 0.6λ and 3.5λ. Such distances, while usually easily attainable on the short wave band, may not be possible in the case of medium or long wave-lengths. (a_1-6, a_2-1, b-1, c-1, d-5, e-0, f-Analysis)

1164. WIRKLER, W. H., "Heterodyne Direction Finder with Frequency Shift and Visual Indicator," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 103; 9 August 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1165. SMITH-ROSE, R. L., BARFIELD, R. H., AND ROSS, W., "Short-Wave Direction Finding Observations in the 30 - 55 Metre Band (1936-1938)," National Physical Laboratory (British) Report No. RRB/C. 5 (BCSO 79-B1-1); 10 August 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Study report)

1166. KINDER, H., "Long-Range Radio Direction Finding System," (German: FFI) See: Air Document Index No. R2792; September 1939.

ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1167. ANONYMOUS, "Instruction Book for Model DU Radio Direction Finding Equipment," U.S. Navy, Bureau of Engineers Instruction Book No. 121. See also Department of Commerce PB38636; October 1939. ABSTRACT: The model DU radio direction finding equipment has been designed to take accurate unilateral and bilateral bearings when used in conjunction with Navy radio receiving equipment of the RU series. It is intended for installation on open cockpit types of Naval aircraft, such as fighter and observation planes, where all operating controls must be accessible to the pilot or observer. The frequency range is 220 to 8000 kc in five bands. Detailed description and installation, initial adjustment and calibration, operation and maintenance instructions are given. Lists of major units, spare parts and manufacturers, schematic, wiring and circuit diagrams, photographs and drawings are included. (a-3, b-3, c-1, d-1, e-845, f-Instructions)

1168. ANONYMOUS, "Preliminary Description and Operating Manual for the Bearing Receiver E. P. 2a, "(German: G.L.Z.) See: Department of Commerce PB56578; October 1939. ABSTRACT: This technical manual gives a description and operating instructions for the EP2a which is a GAF receiver for radio direction finding and general reception. It is portable. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Description)

1169. BURGESS, R. E., "The Screened-Loop Aerial," Wireless Engineer, vol. 16, pp. 492-500; October 1939. ABSTRACT NO. 1: This paper describes a theoretical and experimental investigation of the shielded-loop type of receiving antenna used in D/F and field strength measurements. The theory of the shielded loop is analyzed and the simplifying assumptions made are indicated, and are shown to lead to a good approximation to the value of pick-up for the shielded loop. The pick-up is computed for the special cases of the shield gap, short-circuited, capacitively loaded, and tuned. It is shown that enhanced pick-up may be obtained by the suitable capacitive loading of the gap in preference to an increase of number of loop turns, and the practical aspect of this system is discussed. ABSTRACT NO. 2: This paper describes a theoretical and experimental investigation of the screened loop type of receiving aerial used in direction finding and field-strength measurement. The theory of the screened loop is analysed and the simplifying assumptions made are indicated and are shown to lead to a good first approximation for the value of pick-up for the screened loop. The pick-up is computed for the special cases of the screen gap short circuited, capacitively loaded, and tuned. It is shown that enhanced pick-up may be obtained by the suitable capacitive loading of the gap in preference to an increase of the number of loop turns, and the practical aspect of this system is discussed. Confirmatory experiments are described, and the paper concludes with an indication of a suggested continuation of the investigation. (a_1-6, a_2-1, b-1, c-1, d-5, e-43, f-Theory and analysis)

1170. FELDMAN, C. B., "Deviations of Short Radio Wave from the London-New York Great Circle Path," Proc. IRE, vol. 27, pp. 635-645; October 1939. ABSTRACT: During the past year experiments have been made to determine the frequency of occurrence and extent of deviations of short radio waves from the North Atlantic great circle path. For this purpose the multiple-unit steerable antenna (Musa), described to the Institute at its 1937 convention, has been used to steer a receiving lobe horizontally. This is accomplished by arraying the unit antennae broadside to the general direction from which the waves are expected to arrive. The Musa combining equipment then provides a reception lobe in the horizontal plane, steerable over a limited range of azimuth. Two such Musas have been used, one of which possesses a wide steering range, but is blunt, while the other is sharp but is restricted in range. Transmissions from England have been studied with this equipment at the Holmdel, N. J., radio laboratory of the Bell Telephone Laboratories. Comparisons of results obtained on transmission from antennae directed toward New York, with those from antennae otherwise directed have, to a limited degree, given results representative of the effects of horizontally steerable transmitting directivity. Observations made on these British transmissions during the past eight months have disclosed the following characteristics: (1) During "all-daylight" path conditions, the usual multiplicity of waves distributed in or near the great circle plane, which constitutes normal propagation, has been predominant. Usually neither ionosphere storms nor the catastrophic disturbances associated with short-period fade-outs seem to affect the mode of propagation. (In contrast to (1), during periods of dark or partially illuminated path conditions, the great circle plane no longer provides the sole transmission path. The extent to which other paths are involved varies greatly. Propagation during ionosphere storms of moderate intensity usually involves paths deviated to the south of the great circle, during afternoon and evening hours, New York time. (a-1, b-1, c-1, d-1, e-0, f-Description)

1171. GOLDSTEIN, M. K., "The Medium Frequency Adcock Direction Finder and a Resistance Goniometer," USN, NRL Report No. R-1564; October 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1172. SCHELKUNOFF, S. A., "A General Radiation Formula," Proc. IRE, vol. 27, pp. 660-666; October 1939. ABSTRACT: In this paper a general formula is derived for the power radiated in non-dissipative media by a given distribution of electric and magnetic currents. Magnetic currents are included not only for the sake of greater generality but also because, in problems involving diffraction through apertures and radiation from electric horns, the radiation intensity can be made to depend upon fictitious electic and magnetic current sheets covering the apertures or horn openings. Part I consists of an introductory discussion, summary of the formulae, and examples illustrating the convenience of the general formulae. Part II contains a mathematical derivation of the radiation formulae. (a-1, b-1, c-1, d-1, e-0, f-Theory)

1173. SCHINDELHAUER, F., "Direction-Finding of the Transients Caused by Atmospheric Disturbances," Hochf:tech. u. Elek:akus, vol. 54, pp. 109-111; October 1939. See also Wireless Engineer, vol. 17, p. 68; 1940. ABSTRACT NO. 1: Atmospherics are generally regarded as due to radiation from lightning flashes of a substantially vertical path. It has also been suggested that they may be caused by horizontal currents in the ionosphere. The writer therefore considered it useful to observe that state of polarisation of atmospherics and to pay particular attention to horizontally-polarised radiation. Preliminary experiments are here described; on a wave-length of 32 meters, two horizontal dipoles were erected in the N-S and E-W directions and connected alternately to a single receiver. The quotient Q equals number of disturbances in the N-S dipole divided by number of disturbances in the E-W dipole. The quotient was calculated and had a value near unity, as the dipoles picked up a considerable fraction of the vertically-polarized radiation. For long waves a loop antenna was used and the quotient was calculated. The general conclusions reached are: (1) that the disturbances on low and high frequencies arise in general from the same sources, which emit over the whole frequency spectrum. In the afternoon and evening, disturbances seem to contain only high frequencies, probably due to thunderstorms; (2) the source of the greater part of disturbances lies in the ionosphere and not at earth's surface, and consists of currents flowing in the E-W direction (perpendicular to earth's magnetic field). Practical methods of separating the two kinds of atmospherics are derivable from the experiments. ABSTRACT NO. 2: Atmospherics are received at Potsdam on 2 aerial systems, one for 32 m signals consisting of 2 horizontal dipoles lying E-W and N-S, respectively, and the other a double frame aerial for the reception of long waves, (30,000 m), from E-W and N-S, respectively. Observations were taken about every 2 hours, and for a few minutes at a time, from July to October, 1938. The numbers of atmospherics received, on both short and long waves, are a minimum before noon and rise rapidly in the afternoon and evening. Long-wave atmospherics come chiefly from the E-W direction in the morning and evening, but at midday are more frequently received from N-S. Short-wave atmospherics are received chiefly on the N-S aerial, although in other respects the diurnal variation is similar to that for long waves. It is concluded that the chief source of atmospherics is the ionosphere, and the apparent contradiction in direction for long- and short-wave reception is resolved if it be assumed that the ionospheric currents giving rise to the atmospherics flow E-W, and that both forms of atmospheric have the same origin. Indications are also found, however, of atmospherics probably produced at lower levels by thunderstorms. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Experimental analysis)

1174. ANONYMOUS, "Determination of Direction by Ionosphere Reflected Waves," U.S. War Department; WDGS, FMTRL: List 42, Item 10; 17 October 1939. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1175. ANONYMOUS, "Continuation of Experiments with Direction Finding Antennas Installed on the Surface of Aircraft," (German: FFI) See: Air Document Index No. R2804 F471; November 1939. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Experiment report)

1176. ASTAF'EV, G. P., "The Calculation of the Sensitivity of a

Visual Radio Direction Finder," Izv. Elektroprom. Slab. Toka. No. 6, pp. 18-25; November 1939. See also Wireless Engineer, vol. 17, p. 33; January 1940. ABSTRACT: The principles underlying the operation of visual D/F are discussed in detail, and formulas are derived for determining the meter deflection when the meter is of the electrodynamic type and of the D/C type. A quantity called the "sensitivity modulus" of a D/F is introduced. It is the ratio of the field strength to the meter deflection corresponding to the rotation of the loop antenna through an angle of 1° from the zero position. (a-6, b-1, c-2, d-2, e-0, f-Theory and analysis)

1177. GORDON, R. A., AND SCHRENK, M. H., "Observations of Night Effects on Model CXS Radio Direction Finder below 100 Kcs," USN, NRL Report No. R-1575; 20 November 1939. ABSTRACT: The Model CXS Radio Direction Finder Equipment was used to observe any erratic features or tendencies to false bearings that may be encountered with loop direction finders at night when operating below 100 kcs. Observations were made on identical transmitting stations during day and night periods; these stations were located between 32 and 300, and approximately 3000 miles distant. No stations were received whose location was from 300 to 2500 miles distant over the frequency range 15 to 100 kcs. Observations were made to determine the extent of errors due to wave polarization ("night effect") with resulting reliability of observed bearings, the characteristic of the signal at loop minimum and the reliability of unilateral indication. (a-1, b-3, c-1, d-1, e-120, f-Evaluation)

1178. KING, R., "The Application of Low-Frequency Circuit Analysis to the Problem of Distributed Coupling in Ultrahigh Frequency Circuits," Proc. IRE, vol. 27, pp. 715-724; November 1939. ABSTRACT: The general problem of coupling between circuits which extend beyond the near zone is investigated theoretically. Integrals defining generalised coefficients of inductance are displayed and discussed for the case of the near zone and in general. As an application, the specific problem of determining the current distribution in two coupled circuits which extend beyond the near zone is examined, and solved for the special case of two loosely coupled sections of parallel line. It is proved that the emf induced in the secondary by the primary oscillator may be treated as though concentrated at a point opposite the centre of the oscillator provided the current distribution in the oscillator is symmetrical with respect to this centre. The conclusions are generalised to include other circuits than the parallel line, in particular an antenna coupled to a symmetrical oscillator. Experimental curves are shown which verify the general theory. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

1179. TUSKA C. D., "Radio in Navigation," Frank. Inst. Journ., vol. 228, pp. 433-443, 581-603; October, November 1939. ABSTRACT: After a brief historical introduction, the technical characteristics of the various direction-finding systems now in use are given and some examples of the practical application to sea and air navigation are described. A Bibliography of 94 references is added. (a-3, b-1, c-1, d-1, e-0, f-Description)

1180. JANSKY, K. G., "An Experimental Investigation of the Characteristics of Certain Types of Noise," Proc. IRE, vol. 27, pp. 763-768; December 1939. ABSTRACT: The results of an investigation of the effect of the band width on the effective, average, and peak voltages of several different types of noise are given for band widths up to 122 kc/s. For atmospheric noise and that due to the thermal agitation of electric charge in conductors, both of which consist of a large number of overlapping pulses, the peak, average and effective voltages were all proportional to the square root of the band width. For very sharp, widely separated, clean, noise pulses, the average voltage was independent of the band width and the peak voltage was directly proportional to the band width. For noise of a type falling between these two the effect of the band width depended upon the extent of the overlapping. The ratio of the peak to effective voltage of the noise due to the thermal agitation of electric charge in conductors was measured and found to be 4. The ratio of the average to effective voltage of this type of noise was found to be 0.85. The experiments showed that when a linear rectifier, calibrated by a continuous-wave signal having a known effective voltage, is used to measure the effective voltage of this type of noise the measurements should be increased by 1/2 db to obtain the correct result. (a-1, b-1, c-1, d-1, e-0, f-Evaluation report)

1181. LEA, N., "The Calibration and Correction of Naval Direction Finders," Marconi Review, vol. 15, pp. 18-21; December 1939. See also Wireless Engineer, vol. 7, p. 218; 1930. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-D/F calibration. Note: Discrepancy in dates of the two references.)

1182. WACHTLER, M., AND GOTHE, A., "On the Testing of the Residual Polarization Error of Adcock Direction-Finder Installations for Long Waves," Telefunken Hausmitt, vol. 20, pp. 69-75; December 1939. See also Wireless Engineer, vol. 17, pp. 319-320; July 1940. ABSTRACT: Consideration is given to broadening of minimum when D/F on an airplane. The assertion is made that the "standard wave factor" tests are not adequate. The circle-flight method of testing is examined, and the conclusion reached that it can only give results if simultaneous observations with a loop antenna are carried out on the polarization of the incident field for all directions. The conclusion reached is that, although the testing of a D/F station by both methods is a lengthy business, no satisfactory substitute seems to exist. (a-6, b-1, c-4, d-4, e-0, f-Theoretical analysis)

1940

1183. ANONYMOUS, "Annex to Memorandum No. 2," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 5; 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1184. ANONYMOUS, "Instruction Book for Model DW-1 Aircraft Radio Direction Finding Equipment. Frequency Range 200 to 1600 Kcs," Bendix Radio Corporation, Baltimore, Maryland. See Department of Commerce PB15095; 1940. ABSTRACT NO. 1: The Model DW-1 Radio Direction Finding Equipment has been designed to take accurate unilateral and bilateral bearings when used in conjunction with Navy radio receiving equipment of the Model RU Series. This equipment is intended for installation on the larger types of Naval aircraft, such as patrol and transport planes, where the loop may be plugged into a shaft which extends directly up through the skin of the ship from the direction finder coupling unit in the radio compartment. The direction finding frequency range has been designed to cover the range of from 200 to 1000 kcs in three bands. ABSTRACT NO. 2: This direction finding equipment, manufactured by the Bendix Radio Corporation of Baltimore, has been designed to take accurate unilateral and bilateral bearings when used in conjunction with Navy radio receiving equipment of the model RU series. It is intended for installation on the larger types of Naval aircraft such as patrol and transport planes, where the loop may be plugged into a shaft which extends directly up through the skin of the ship from the direction finder coupling unit in the radio compartment. It consists of a loop antenna, vacuum amplifying tubes, and suitable signal coupling circuits for determining, without ambiguity, the hearing of a radio transmitting station when the equipment is used with a suitable vertical antenna. Report gives a detailed description, and directions for installation, initial adjustments and calibration, operation and maintenance, lists of parts and manufacturers, photograph, and descriptive, schematic and wiring diagrams. (a_1-1, a_2-3, b-3, c-1, d-1, e-845, f-Instructions)

1185. ANONYMOUS, "Model DQ-4 Radio Direction Finding Equipment," RCA Manufacturing Company, Camden, N. J. Instruction Book No. IB 38063. See also Department of Commerce PB17890, 1940. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder Equipment specified. This equipment is designed to operate from 110 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1186. ANONYMOUS, "Radio Compasses and Direction Finders with Instantaneous Automatic Operation," Federal Telephone and Radio Corporation, Newark, New Jersey: TM-2; 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1187. ANONYMOUS, "Report on Direction Finding on Ultrashort Waves," Baddow Research Lab., Marconi, Chelmsford, England; 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1188. BLACK, A. F., "Amateur Direction-Finding," Wireless World, vol. 46, pp. 316-319; July 1940; pp. 357-359; August, 1940. ABSTRACT: Design of simple direction finder presented; circuit diagram given; procedure in taking and laying off bearings explained. (a-3, b-1, c-1, d-5, e-0, f-Description)

1189. BOWLES, E. L., et al., "The CAA-MIT Microwave Instrument Landing System," Trans. Amer. Inst. Elect. Engrs., vol. 59, pp. 859-

865; Disc., 1120; 1940. ABSTRACT: A new aeroplane blind landing system is a 3-point system using 50 mc transmitters with directional horns. The receivers employ a superheterodyne circuit, and a signal strength of lm V/m gives an effective range of about 5 miles. An improved system using 10 cm waves is proposed. (a-3, b-1, c-1, d-1, e-0, f-Description)

1190. BURKARD, O., "On the Problem of Space-Wave Propagation," Hochf: Tech. u. Elek: akus, vol. 56, p. 97; 1940. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1191. DINGLEY, E. M., "A True Omnidirectional Radio Beacon System," Communications, vol. 20, p. 5; 1940. ABSTRACT: Beacon defined as radio transmitting equipment capable of radiating equal amounts of signal power simultaneously and continuously in all azimuthal directions in such manner that signal radiated on any one azimuth has characteristic distinguishing it from signal radiated on all other azimuths; recent developments in design and use of frequency modulated transmitters are described. (a-3, b-1, c-1, d-1, e-0, f-Description)

1192. DOLUKHANOV, M. P., "Investigation of Certain Errors in Radio Homing Devices," Izv. Elektroprom. Slab. Toka, No. 7, pp. 1-13; 1940. See also Wireless Engineer, vol. 20, p. 47; January 1943. ABSTRACT: A mathematical discussion of errors in radio homing devices, specifically: (1) asymmetric of the balanced modulator, (2) phase displacement in the non-directional antenna channel, (3) parasitic modulation, (4) antenna effect, (5) inaccurate tuning of circuits. For each of the above, formulas are derived for determining the error introduced. A summary of the conclusions reached is given and a number of practical suggestions are made. (a-6, b-1, c-2, d-2, e-0, f-Theoretical analysis)

1193. GAINSBOROUGH, G. F., "Diffraction of Ultra-short Radio Waves," National Physical Laboratory (British) Report No. RRB/C.2, ca; 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Date of report uncertain)

1194. HENDERSON, J. T., "Cathode-Ray Direction Finding," Proc. IRE, vol. 28, p. 94; 1940. ABSTRACT: J. T. Henderson, chief of the radio section of the National Research Council, presented a paper on "Cathode-Ray Direction Finders." An outline was given of the early history of the subject following the original suggestion by Watson-Watt in England about 1915. The Research Council started active work on the subject about 1934 and descriptions were given of early models and also of long-wave fixed stations which were set up near Winnipeg and Ottawa for the directional study of atmospherics. Both loop and Adcock aerials were used. The relative advantages and disadvantages of cathode-ray and of aural null systems were described. A demonstration concluded the paper. (a-2, b-1, c-1, d-1, e-0, f-Survey)

1195. JACKSON, W. E., ET AL., "Development of the Civil Aeronautics Authority Instrument Landing System at Indianapolis," Trans. Amer. Inst. Elect. Engrs., vol. 59, pp. 849-858; 1940. See also Elect. Commun., vol. 18, pp. 285-302; April 1940. ABSTRACT: The history of the development of blind-landing devices since 1928 is sketched, and a full description follows of the radio system installed at Indianapolis by the International Telephone Development Co. In this system 4 complete sets of apparatus are installed to facilitate landing from 4 directions and 4 elements are required for each direction; a localiser for lateral guidance, a radio glide path for descent and 2 markers to indicate progress along the course. Ultra-short waves are used throughout. The arrangements for the various signals are briefly described, including the glide path, which is made straight until the runway is approached, when its slope is gradually reduced; the layout on the airfield is given in detail. Experiment with different widths of the constant-intensity path guiding the pilot shows that much narrower paths are desirable than those formerly used. Horizontal polarization, completely free from any vertical component, is best used, a small percentage of vertical resulting in an ambiguous course. The receiving equipment in the aircraft, the information gained from tests and the views of pilots on desirable improvements are described, and discussed. (a-3, b-1, c-1, d-1, e-0, f-Survey and description)

1196. MAKOV, S. A., "Small-Dimensional Radiating and Receiving Systems of High Directivity," Comptes Rendus Acad. Sci. URSS, vol. 28, p. 418; 1940. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

1197. OKADA, M., "Research on Wireless Guiding System for Aircraft." Electrot. Laborat. Japan, Res., vol. 42, p. 155; 1940. See also Engin Index, p. 327, 1941. ABSTRACT: The article gives a description of a new system, using an Adcock antenna and a non-directional antenna, for airplane guidance while in flight, and landing, and a description of the system used as a radio-range beacon. Notes on equipment used and the operating principles of the system are given. The article has an English transcription. (a-6, b-1, c-6, d-6, e-0, f-Description)

1198. PLEMYANNIKOV, A. N., "An Analysis of Goniometers for Radio Beacons," Izvestiya Elektroprom. Slab. Toka, vol. 12, pp. 44-51; 1940. See also Wireless Engineer, vol. 21, p. 92; 1944. ABSTRACT: On the basis of an investigation by Foelsch formulae are derived for calculating the magnetic field of a cylindrical coil, and various methods for increasing the uniformity of the field along the axis of the coil are surveyed. Two types of radio beacon are then considered: one in which the polar diagram is rotated (Fig. 3) and the other, the American type TR.400, which operates on the principle of a fixed equi-signal zone (Fig. 5). The operation of the two types is discussed and various factors affecting their accuracy are analysed. A number of experimental curves are plotted. Some practical suggestions are also made to increase the accuracy of the beacons. (a-2, b-1, c-2, d-2, e-0, f-Thorough experimental study)

1199. RUNGE, W., "Wireless Direction Finding," Telefunken-Hausmitt., vol. 20, p. 7; 1940. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1200. ANONYMOUS, "Instruction Book Model AR-8707 Direction Finder," Radiomarine Corporation of America, New York, New York; January 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1201. ANONYMOUS, "Sperry Automatic Radio Direction-Finder Mark I," Sperry Gyroscope Company, Inc., Great Neck, Long Island, New York, Report No. 15-85; January 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1202. BAINBRIDGE BELL, L., "Report on Visit to Paris by L. Bainbridge-Bell," Admiralty Signal Establishment (British) Report No. M. 325; 1 January 1940. ABSTRACT: Not available. (a-1, b-3, c-1, d-5, e-0, f-0)

1203. ANONYMOUS, "Model DP-11 Radio Direction Finder Equipment, Frequency Range 100-1500 K.C., A.C. Operation," Radio Corporation of America: Instruction Book No. IB38062; 9 January 1940. See also Department of Commerce PB17407. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder Equipment specified above. This equipment is designed to operate from 110 volts, 60 cycles, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The receiver for this equipment differs from the previous instruments by the addition of an antenna input protective relay and a neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use. The neon protective device bypasses high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. Other minor mechanical features have been improved. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1204. ANONYMOUS, "New System of Radio Direction Finding and Radio Beacons for Aviation in Germany," Telecom., vol. 7, pp. 45-50; February 1940. See also Engin. Index, p. 329; 1940. ABSTRACT: The article gives descriptions of an H-Adcock System, rotating ultra-short-wave radio beacons, a new ultra-short-wave receiver for installation on aircraft, and radio beacons for landing of airplanes, and for identification of mountains. (a-6, b-1, c-3, d-3, e-0, f-Description)

1205. JACKSON, W. E., "The Impetus Which Aviation Has Given to the Application of Ultrahigh Frequencies," Proc. IRE, vol. 28, pp. 49-51; February 1940. ABSTRACT: This paper briefly mentions some of the most important applications of uhf in the field of aeronautics and describes one of them in some detail. This is the uhf radio range,

a short-wave counterpart of the conventional long-wave radio range which now provides directional guidance along the Federal Airways of the U.S.A. A direct comparison is made between the 2 by means of graphs based on signal recordings made during flight tests of a standard long-wave range and an uhf range operating under the same conditions and at the same location near Pittsburgh, Pa. The advantages of uhf over lf are strikingly illustrated. (a-1, b-1, c-1, d-1, e-0, f-Descriptive survey)

1206. LEE, J. M., AND JACKSON, C. H., "Preliminary Investigation of Effects of Wave Polarization and Site Determination with Portable Ultra-high-Frequency Visual Radio Range," U.S. Civ. Aeronautics Authority - Tech Development Division - Report No. 9; February 1940. ABSTRACT: Effects of horizontal and vertical polarization on ultrahigh frequency radio range transmission; general site requirements for installation of equipment; particular attention devoted to effects of polarization on multiple course phenomenon; portable equipment used in investigation described. (a-1, b-3, c-1, d-1, e-0, f-Study)

1207. ANONYMOUS, "Descriptive Literature on Sargent Radio Direction Finding Equipments," Sargent Company, EM.; Oakland, California; March 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1208. ROSS, W., "Site and Path Errors in Short-Wave Direction Finding," National Physical Laboratory (British) Report No. RRB/C.3; 15 March 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-D/F error)

1209. NORTON, K. A., "The Calculation of Ground Wave Field Intensity over a Finitely Conducting Spherical Earth," (Before the F.C.C.); 18 March 1940. See Proc. IRE; December 1941. ABSTRACT: Within the last few years many theoretical papers have appeared which deal with the calculation of ground wave field intensity. It is the purpose of this report to summarise the results obtained in these papers and to present graphical methods for the computation of ground wave field intensity which may easily be used by the engineer. The ground wave is here considered to be the portion of a radio wave that is propagated through space and is, ordinarily, affected by the presence of the ground; the ground wave does not include any portion of the wave reflected from anything other than the ground; it is thus exclusive of ionospheric waves (sky waves) and of tropospheric waves. The ground wave is, however, slightly refracted by the gradual decrease with height of the dielectric constant of the lower atmosphere. In the following discussion the earth is assumed to be a perfect sphere with uniform ground constants surrounded by an atmosphere in which the dielectric constant decreases uniformly with height. Some discussion will also be given of the effect of some of the variations in the atmosphere from these idealised conditions. The calculation of ground wave field intensity is accomplished most readily in three steps: First, the field intensity is calculated at short distances (for which the earth may be assumed to be a plane); next, the field is calculated at large distances (using the spherical earth analysis); the third step consists in extending the curves obtained by the plane earth theory at short distances so that they merge smoothly with the curves obtained at large distances by the sperical earth theory. The whole process gives results which usually correspond within 10% or less to those obtained by the long and tedious process of computing and adding (in proper phase) long series of terms, this latter method constituting the only other means of arriving at a solution. The transmitting antenna is assumed to be either a vertical electric doublet or a vertical magnetic doublet with a free space field intensity at a unit distance equal to E_0 in the equatorial plane of the doublet. The theory is applicable for other transmitting antennas provided an appropriate value of E_0 is used and the directivity considered; for example, with one kilowatt radiated from a half-wave dipole in free space, E_0 = 137.6 millivolts per meter at one mile in the equatorial plane of the dipole. The equations to be given are for the vertical electric field as received on a vertical electric doublet or for the horizontal electric field as received on a vertical magnetic doublet; the theory is applicable for other receiving antennas provided the directivity relative to the doublet is appropriately considered. Graphical methods have outlined which make possible the calculation of ground wave field intensity at any radio frequency, for any point in space and for any set of ground constants found in practice. These methods take into account the effects of the curvature of the earth and the effects of air refraction in the troposphere. Curves are given of Ground Wave Field Intensity versus Distance for ground constants ϵ 5 $\times 10^{11}$ and for seawater ϵ = 80 (a-1 and 4, b-3, c-1, d-1, e-279, f-Theory)

1210. ANONYMOUS, "Instruction Book for Model GQ Aircraft Radio Equipment," U.S. Bureau of Engineering; Mfr: Radio Research Company, Inc. See Department of Commerce PB38113; April 1940. ABSTRACT: The model GQ equipment has been developed especially for installation in single and double seated fighting and bombing planes of the U.S. Navy. It may be used as well in other types of land and sea planes, the design being particularly suited for itinerant aircraft in long range flying over the civil airway facilities of the United States. The complete equipment provides radio receiving, homing and transmitting facilities with complete remote control of each. The receiving equipment permits reception of modulated continuous wave telegraph and radio telephone signals within two frequency ranges: From 150 to 1500 kcs and from 1.8 to 15 mcs. The The frequency range of 150 to 1500 kcs may also be used for homing. The transmitting components permit radio telephone communication in the frequency range of from 3000 to 7000 kcs with a power output of 15 watts. The receiver is a superheterodyne employing 4-6K7G, 1-6L7G, 1-6R7G, and 1-6K6G type tubes. The transmitter employ a crystal controlled oscillator exciting a plate modulated power amplifier. Tubes used are a type 807 crystal oscillator, two type 807 power amplifiers, a type 42 speech amplifier, and two type 807 modulators. All power for the equipment is drawn from the plane's primary battery supply through a dynamotor-filter unit. Photographs, drawings, diagrams, and a part list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1211. ANONYMOUS, "Instructions for Fitting and Operating Marconi D/F Set Type 579," Admiralty Signal Establishment (British) Report No. M.327; April 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Instructions)

1212. ALFORD, A., AND KANDOIAN, A. G., "Ultra High Frequency Loop Antennas," Elect. Comm., vol. 18, pp. 255-265; April 1940. ABSTRACT: A loop consisting of four elements arranged as a square, each element carrying currents of the same phase and amplitude, is considered theoretically. The field distribution round the aerial and its radiation resistance are worked out. Practical forms of the aerial are described, and the results of field strength measurements verifying the calculations are shown in diagrams. Radiation efficiency may rise as high as 95%. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

1213. BARFIELD, R. H., "The Performance and Limitations of the Compensated-Loop Direction Finder," JIEE, vol. 86, pp. 396-398; April 1940. See also Wireless Engineer, vol. 17, p. 373; August 1940. ABSTRACT NO. 1: Disadvantages, compared with Adcock system, of both single-dipole and double-dipole compensated types: the single dipole type has much greater pick-up, and moderate polarisation error on ground of good conductivity: possible improvement by artificial increase of conductivity. ABSTRACT NO. 2: The principle of both the single-dipole and double-dipole compensated loop direction-finder is described and reference is made to several patents which embody applications of these principles. A brief account is given of the theoretical and practical work carried out at Slough on the single-dipole system. It is shown that this system can in certain circumstances be made to have a considerably higher pick-up factor for a given overall area than the Adcock direction-finder but that it is limited to use on ground of good conductivity. The double-dipole system, on the other hand, is independent of ground conductivity but has no superiority over the "H" type of Adcock system as regards pick-up factor. (a_1-6, a_2-2, b-1, c-1, d-5, e-0, f-Descriptive theory and analysis)

1214. HASTINGS, H. F., "Instructions for the Installation and Operation of Model DY Radio Direction Finder Equipment, Range 2.5 to 30 Mcs," U.S. Navy Yard, New York, Report:RW69A-151; April 1940. See also Department of Commerce PB17490. ABSTRACT: The Model DY high frequency direction finder is designed for taking radio bearings in the range 2500 to 30,000 kilocycles, and is for permanent shore station location. The complete equipment can be assembled in approximately one hour. The Model DY high frequency direction finder differs from previous models of similar equipment in that it may be operated from the base of the tower, and the operator is afforded protection from the weather by means of a canvas cover. (a-1, b-3, c-1, d-1, e-0, f-Instructions)

1215. GOLDSTEIN, M. K., "Calibration Analyses of First Naval District Shore D/F Stations," NRL Report R-1606; April 11, 1940. ABSTRACT: This report deals with the calibration analyses of the First District Shore Navigation Direction Finder Stations. The importance of coast line and local conditions on deviations as reported by other investigators is reviewed, discussed and summarized. Following this, an analysis is made of the deviation and balance curves from each of the six shore stations, from which evidence is obtained

pointing to the most probable cause of the more serious and frequently the more unstable deviation influences. Of considerable assistance in analyzing the data has been the Polar Method of plotting the normal deviation curves and the "Station Layout" on the same sheet. A new method for extending and simplifying the Polar Method of analysis is reported. The improvement is due to the manner in which the balancer curve is converted into a proportional and somewhat fictitious balancer deviation curve. When the latter is superimposed upon the normal deviation curve, a shaded area between them is obtained whose sign, magnitude, shape and displacement uniquely define the deviation and balancer calibration data. Since such areas can be obtained for each frequency of calibration, their family can be plotted on the polar co-ordinate curve sheet containing the "Station Layout." The consolidation of the balancer, deviation and "Station Layout" data on a single curve sheet results in a summarized or "Polar Composite Calibration Chart" (e.g., see Plate I) from which it is possible to obtain a simplified and concise picture of the station's coordinated physical and electrical characteristics. Use of the "Polar Composite Calibration Chart" allows a more natural correlation to be noted between the abnormal behavior of the shaded areas and the structure, coast line or other component of the "Station Layout" most likely responsible. No serious harmonic analysis investigation is reported, since in an attempt to make such analyses of the calibration data an unwarrantable amount of time and effort was required (to obtain, then plot in proper phase and magnitude, the several components of each deviation and balancer curve) for the amount of correlation information contributed. (a-1, b-3, c-1, d-1, e-133, f-Thorough analysis)

1216. HAUZENDORFER, W., "Improved Direction Finder Oscillograph," (German: DLV) See: Air Document Index No. R4024 F46-81; April 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1217. HAZELTINE, W. R., "Diffraction of Radio Ranges by Hills," Phys. Rev., vol. 57, p. 717; April 1940. ABSTRACT: The scattering of electromagnetic waves by hemispherical obstacles on a conducting plane has been investigated. The results have been applied to the problem of the splitting of radio range beacons when the range passes over hilly country. The calculations refer particularly to long wavelengths (about 1000 meters) such as used in the Oakland range. It is found that even hills of moderate size can cause wide spatial fluctuations in the received signal strength. The results of numerical calculation for one simple model of the terrain are reported. The beam is found to split into several parallel courses, giving a pattern of the same type as is observed in the field. It is concluded that this phenomenon is a typical diffraction effect. (a-1, b-1, c-1, d-1, e-0, f-Theory and analysis)

1218. SMITH-ROSE, R. L., AND HOPKINS, H. G., "Radio Direction Finding on Wave-lengths between 2 and 3 Meters," Electrician, vol. 124, p. 288; April 1940. See also JIEE, vol. 87, pp. 154-158; Disc., 159-160; August 1940. ABSTRACT NO. 1: Preliminary investigations, with ranges up to 30 miles; errors somewhat larger than on 6-10 meter waves; octantal error produced by wooden hut, depending on nature of wood and direction of grain. Summary of IEE paper. ABSTRACT NO. 2: This paper describes a preliminary investigation with the aid of instruments fitted with rotating aerial systems similar to those used in earlier work in the band 6 m to 10 m (30 to 50 Mc/s). The sensitivities of the loop and Adcock direction-finders used are such that bearings with a swing of ± 5° can be obtained with field strengths of 20 and 40μV/m, respectively. The reciprocal error of the instruments has been reduced to 1°, and the polarization error can be kept below 5° for angles of incidence and polarization to the vertical of 60°, although readjustment of the compensation arrangement is required to maintain this over an appreciable wave-band. The 2 direction-finders have been operated at various distances up to 30 miles from an experimental transmitter developing 100 W on a wavelength of 3 m, and the average errors varied from about 10° at 1 mile to 3.5° at 20 miles with a vertical transmitting aerial. These errors are somewhat larger than the corresponding values found for the longer-wave band of 6m to 10m (30 to 50 Mc/s). When an attempt was made to use a direction-finder inside a wooden hut, the observations were found to be subject to an octantal error of 2° to 5° amplitude, the value increasing as the wave-length was reduced. This error was found to be due to reflection effects from the walls of the hut, and experiments made with various wooden boards showed that it depended upon the nature of the wood and direction of the grain. A synthetic material with no grain direction was found to have only a small effect. (a_1-6, a_2-1, b-1, c-1, d-5, e-0, f-Experiment report)

1219. STRAFFORD, F. R. W., "Ultra-Short-Wave Aerial Systems," Wireless World, vol. 46, no. 6, pp. 224-227; April 1940. ABSTRACT: This is a simple treatise on characteristics and the design of different aerial systems for UHF frequencies. (a-4, b-2, c-1, d-5, e-0, f-Description)

1220. BACHEM, C., "Compensator for Decimeter-Wave Antennas," (German: DLV) See: Air Document Index No. R4024 F; May 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1221. HAUZENDORFER, W., "Description of UHF Direction Finder Type C 227, for Airplanes," (German: DLV) See: Air Document Index No. R4024 F137-152; May 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1222. LUKE CHIA-LIU YUAN, "Direction-Finding at 1.67 Meter Waves," Science, vol. 91, p. 524; May 1940. ABSTRACT NO. 1: A brief report on D/F work done on 1.67 meter wave-lengths at California Institute of Technology. The D/F work was done in connection with balloon-borne radio equipment for making meterological measurements. ABSTRACT NO. 2: Since direction finding at ultra high frequency is drawing more interest, I should like to give a brief report on the direction finding work at 1.67-meter waves which has been done in this laboratory. Up to about two years ago we had been working on a radio-meteorograph sent up with balloons to get the atmospheric temperature, pressure and humidity at various levels from the ground up into the stratosphere. This instrument was developed in this laboratory, and it has been used successfully by the United States Weather Bureau in securing data for weather forecasting. Different antenna systems were tested for both horizontal and vertical directivity on this wave-length at distances of from seven to thirty miles. The antennas used in these experiments included parabolic antenna, V-type, double V-type, Adcock antennas, etc. Using an Adcock antenna the azimuth of the incoming electromagnetic wave can be defined within one half degree accuracy, and with a slight modification of the receiving elements to form a horizontal H antenna, the vertical angle of the incoming wave can also be obtained with the same degree of accuracy. The former antenna can be converted into the latter by mechanical means within a few seconds and thus both vertical and horizontal angles can be measured with the same antenna set-up. With the antenna one and a half wave-lengths above the ground and with the ground surface homogeneous in the immediate vicinity of the receiving antenna, the direction of the incoming electromagnetic wave coincides with that of the transmitter emitting the wave, within the same accuracy of one-half degree. Since the frequency used is so high that there is no reflection from the Heaviside layer, this eliminates the erroneous directions experienced with longer wave-lengths. The main difficulty of this experiment seems to lie in the surface conditions of the ground in the vicinity of the receiving antenna. When the ground is wet, and especially when the moisture is not uniformly distributed, deviation of the incoming wave from the true direction of the transmitter arises. Attempts are now being made to overcome this difficulty. The receiver used for this experiment is a super-heterodyne receiver specially designed for this purpose using a resistance-coupled intermediate-frequency amplifier. It is very stable in operation and has ample sensitivity. The main purpose of this experiment is to apply the directional effect to get wind velocities using the same type of radio-meteorograph and balloons as mentioned above. The work is being continued in this laboratory and the complete details will be published later. (a_1-6, a_2-1, b-2, c-1, d-1, e-0, f-Descriptive survey. Abstract is essentially the complete paper.)

1223. GORDON, R. A., AND SOUKARAS, K. M., "Report on Model XDZ Radio Direction Finder Equipment," USN, NRL Report No. R-1613; 1 May 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Test report)

1224. ANONYMOUS, "The Experimental Short Wave Direction Finding Station at Baldock," General Post Office (British) Report No. 611; 6 May 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-D/F station)

1225. ECKERSLEY, T. L., "Analysis of Effect of Scattering in Radio Transmission," JIEE, vol. 86, pp. 548-563; Disc., 563-567; June 1940. ABSTRACT: It has been known for a long time that signals from strong commercial stations can be received in the skip zone. Early investigations with a short-wave Adcock direction-finder showed that the signals within the skip zone are in general characterized by absence of bearings. The present paper is a complete investigation into the causes of such effects. It was found that they are due to momentary irregularities and small clouds in the E region of the ionosphere. These irregularities produce scattered signals. The inves-

tigation, first carried out with the Adcock direction-finder, was later made more definite and accurate by using short impulses from high-power stations. The later investigations entirely confirmed the original deductions. The effects of such scattering on long-distance transmission, direction-finding etc., are discussed. The phenomenon is considered to be a major factor in practically all transmission. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

1226. GORDON, R. A., "Test of Preliminary Model XDU-1 Radio Direction Finder Equipment, Submitted by Bendix Radio Corp," USN, NRL Report No. R-1628; June 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1227. TERMAN, F. E., AND PETTIT, J. M., "A Proposal for Reduction of Polarization Errors in Loop Direction Finders," Proc. IRE, vol. 28, p. 285; June 1940. ABSTRACT NO. 1: Paper delivered before IRE Pacific Coast Convention, August, 1940. The paper describes a method of reducing polarization error, by means of a horizontal dipole mounted on the loop and suitably coupled to the input system of the receiver. ABSTRACT NO. 2: One of the serious limitations of the radio compass has been the "night-effect" error caused by the horizontally polarized component of the sky wave which is picked up by the horizontal elements of the loop. The Adcock antenna overcomes this limitation but in proportion to size has low pickup to vertically polarized waves and so is not suitable for most applications. The remedy proposed in this paper is to employ the conventional multiturn loop, with all its undesired pickup of the horizontal component, and then by means of additional horizontal pickup from an auxiliary antenna to neutralize the unwanted component in the output circuit of the main loop. The requirements of the system are that the auxiliary antenna provide a voltage which can be coupled into the loop output circuit through a simple network, and which will perform properly for the desired range of wave-length, signal azimuth, angle of incidence of the sky wave, etc. The analysis shows that when the earth has a high reflection coefficient a horizontal dipole antenna, mounted on the main loop (and rotating with it) and suitably coupled, is capable of providing complete or nearly complete neutralization of the horizontal pickup, with no tuning required other than an initial adjustment. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Theory)

1228. ANONYMOUS, "Report of Tests of Automatic Direction Finders," United Airlines, Chicago, Illinois; 11 July 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test reports)

1229. SMARTZ, R. O., "Manual of Supplementary Instructions for Model DAB Direction Finder," USN, NRL Letter Report No. RA 69A 221; 15 July 1940. ABSTRACT: Not available, however, the DAB was a coaxial spaced loop with individually tuned loops. (a-4, b-3, c-1, d-1, e-see 537, f-Instruction manual. See Abstract 1096)

1230. BRUNING, J. M., "Radio Direction Finding," QST, vol. 24, pp. 19-23; August 1940. ABSTRACT: Describes amateur equipment for locating "hidden" radio transmitter, together with elementary discourse on D/F principles. (a-6, b-2, c-1, d-1, e-0, f-Description)

1231. MC PETRIE, J. S., AND STRICKLAND, A. C., "Reflection Curves and Propagation Characteristics of Radio Waves along the Earth's Surface," JIEE, vol. 87, No 524, pp. 135-145; Disc., pp. 159-162; August 1940. ABSTRACT: The paper contains curves from which the reflection coefficient at the earth's surface for radio waves of any state of polarization can be determined for angles of incidence greater than 80°. It is pointed out that the ray theory, on which the reflection from a reflector is assumed to be equal to the radiation from an image of the transmitting aerial in the reflecting surface, is not applicable at grazing incidence unless the heights of the transmitting and receiving aerials are comparable with the wave-length. From an analysis given by Norton, however, it is deducted that, when the ray theory does not apply, the field at the receiver is equal in most practical cases to the vector addition of two fields, one that given by the ray theory, and the other, which corresponds to the Sommerfeld surface wave having a magnitude dependent on the electrical properties of the reflector and the distance between transmitter and receiver but independent of the heights of transmitter and receiver. The ratio of the magnitudes of the surface waves to image fields is much less for horizontally than for vertically polarized waves, so that the ray theory is applicable over a wider range of angles of incidence for horizontally than for vertically polarized waves. (a-1, b-1, c-1, d-5 e-0, f-Theory)

1232. SOUKARAS, K. M., "Test on Antenna Loop Position Unit, Submitted by W. L. Maxson Corp.," NRL Report R-1636 August 1040. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1233. MAKOV, S. A., "Small-Dimensional Radiating and Receiving Systems of High Directivity," C. R. Acad. Sci. U.R.S.S., vol. 28, no. 5, pp. 418-422; 20 August 1940. ABSTRACT: Acoustic and radio systems, small compared with the wave-length, and with practically constant directivity over a range of frequencies, can be formed from a number of nondirectional radiators by suitable adjustment of the phase and amplitude of their outputs. Three equally spaced collinear point sources, separated by D/2, the outer pair operated in equal amplitude and phase, the other adjusted in amplitude and phase to cancel the signal in the direction of the line of sources, give a polar diagram of the form $R_a \doteq \cos^2 \alpha$ for $\alpha < D/\lambda < 0.5$. Three-element rectilinear systems directed along the line of sources by making the centre source cancel the effect of the other two in the broadside direction give similar broad frequency bands of operation. The directivity can be improved by using more sources, while maintaining a wide frequency range of operation. Combinations of such systems in perpendicular directions, or the use of point and annular sources give three-dimensional directivity. (a-5, b-1, c-2, d-2, e-0, f-Analysis)

1234. ANONYMOUS, "A Recorder for the EZ 2 Direction Finder Receiver," (German: DLV) See: Air Document Index No. R2813F728; September 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1235. ANONYMOUS, "Preliminary Instructions for Bearing Indicator Kit MC-551-( )," Signal Corps, Engineering Laboratory, Belmar, New Jersey; ca September 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1236. ANONYMOUS, "Preliminary Instructions for Homing Attachment RC-300 (Hand Portable D/F)," Signal Corps, Engineering Laboratory, Belmar, New Jersey; ca September 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1237. BHAR, J. N., "Radio Fade-Outs and Their Origin," Science and Culture, vol. 6, pp. 150-157; September 1940. ABSTRACT: This is a general account of the ionospheric regions and the main facts relating to radio fade-outs is given. Simultaneous disturbances of the terrestrial magnetic field and of earth currents, and the appearance of solar eruptions, are discussed, their bearing on the explanation of fade-outs being considered. Reasons are given for believing that the ionization of region D increases and that of region F slightly decreases during a fade-out, and the types of solar emission which might account for these phenomena are explored briefly. (a-3, b-2, c-1, d-0, e-0, f-Theory)

1238. HANSEL, P. G., "Notes on Antennas for Radio Direction Finders," Signal Corps, Engineering Laboratory, (Coles: D/F Group); ca September 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1239. HODGSON, A. D., "Civil Air Transport Communication," JIEE, vol. 87, pp. 317-343; Disc, 344-350; September 1940. ABSTRACT: Any form of transport calls for a communication and signaling system, and by its nature civil air transport has to rely on radio-telegraphy and radio-telephony for the majority of the services it requires and is peculiarly dependent on navigational help by radio. As a result, an extensive communication system has been built up to provide these services throughout the world, a system which is closely interconnected internationally and which provides a service for the aircraft of any country operating on the various routes. The paper gives a description of the system in this country and its immediate connections to the Continental and Empire networks, with some reference to the American system as an indication of the general differences between American and European practice. The paper is divided into the following sections. (1) The growth of the communication system. (2) Technical considerations and requirements of ground-station equipment. (3) Aircraft radio equipment and installation. (4) The Atlantic and Empire routes to the East. (5) A brief outline of the communication system in the U.S.A. (6) Future developments. (a-1, b-1, c-1, d-5, e-0, f-Description)

1240. LEPPERT, M. L., AND NORGORDEN, O., "Measurement of Transmission Characteristics of Shipboard Antenna Systems," NRL Report No. R-1652; September 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Experiment)

1241. LUKE CHIA-LIU YUAN, AND MILLER, C. E., "An Ultra-High-Frequency Superheterodyne Receiver for Direction-Finding," Rev. Sci. Instr., vol. 11, pp. 273-276; September 1940. ABSTRACT NO. 1: The article describes a UHF superheterodyne receiver constructed for D/F on 1.67 meters. The IF amplifier was of a resistance-coupled type using television type tubes. The receiver has high gain and high signal-to-noise ratio. Bandwidth is about 110 Kcs. ABSTRACT NO. 2: An uhf superheterodyne receiver, simple in operation, having high sensitivity and stability, was constructed primarily for direction finding on 1.67 m waves. The 220 kc/s intermediate frequency amplifier using resistance-coupled high-μ television type tubes has a constant gain of 110,000 over a 110 kc/s band. This flat intermediate frequency response allows for any slight variation in the oscillator or signal frequency, due to temperature variations etc., without affecting the output of the receiver. A high gain and a high signal/noise ratio make the receiver well suited for direction-finding observations by the null-point method. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Description)

1242 MOORE, C. B., "Test of Radio Set SCR-255-T-4 (Navy Type DY Adcock Direction Finder, Frequency Range 0.54 - 30 Mc)," Signal Corps, Engineering Laboratories, Monmouth, Report No. 716, (Coles: D/F Group); 19 September 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1243. ANONYMOUS, "Direction Finding Equipment Peil G V," (German: LHS) See: Air Document Index No. R2730 F520; October 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1244. ANONYMOUS, "Impulse Direction Finding," Baddow Research Laboratory, Marconi, Chelmsford, England; October 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1245. BROWN, G. H., "Vertical versus Horizontal Polarization," Electronics, vol. 13, pp. 20-23; October 1940. ABSTRACT: The problem considered is whether reception by aerials at different heights above ground is better for vertically or horizontally polarized signals. For given separation and heights of receiving and sending aerials the received field strengths are calculated approximately on ideal assumptions, and the test of signal/noise ratio is then introduced. For this purpose the noise is assumed to originate in a source at a chosen height and distance and to emit equal intensities of vertical and horizontal polarization. Assumptions are also made regarding the internal noise in the receiver in order to derive the following broad conclusions: (1) When both aerials are low, stronger signals are received with vertical polarization; (2) when the transmitting aerial is a few wavelengths high, horizontal polarization is better; (3) between mobile transmitting and receiving units vertical polarization is superior; (4) wherever receiver noise is great, vertical polarization has advantages. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

1246. MCGILLIVRAY, J. A., "Direct-Reading Direction-Finding," Wireless Wld., vol. 46, pp. 428-429; October 1940. ABSTRACT: The author suggests 2 methods - one mechanical and the other electronic - of obtaining a direct visual indication of the bearing of a distant station. The systems are especially applicable to aircraft. (a-3, b-1, c-1, d-5, e-0, f-Evaluation)

1247. NORGORDEN, O., "Investigation of Antenna Systems on USS Sea Dragon, USS Sea Raven, USS Tambor, USS Trippe, and USS Mayrant," USN, NRL Report No. R-1658; October 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Field study)

1248. PRIEBE, F. K., AND COLE, R. I., "Study of Errors of Ground Station Direction Finders as Obtained by Commercial and Government Agencies (Including the Signal Corps Laboratories)," Signal Corps Engineering Laboratories, Monmouth, Report No. 719 (Coles: D/F Group); 15 October 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Error study)

1249. ANONYMOUS, "Investigations on a Magnetic Recording Device for 20 Kilocycles," (German: Blaupunktwerke) See: Air Document Index No. R2216 F365; November 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1250. ANONYMOUS, "Preliminary Description and Operating Instructions for the Airborne Homing Direction-Finding Device G IV," (German) See: Air Document Index No. R2071 F636; November 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description and instructions)

1251. ANONYMOUS, "Use of Parabolic Cylindrical Reflectors for D/F on Centimetre Waves," Admiralty Signal Establishment (British) Report No. M. 348; November 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1252. ANONYMOUS, "Wireless Equipment of the Luftwaffe," Wireless World, vol. 46, pp. 450-452; November 1940. ABSTRACT: The radio equipment of the ME109 fighter is rudimentary, but that on bombers and bomber-fighters ME110, HE111, H and Ju.88, consists of long- and short-wave transmitters and receivers for ranges of 300-600 kc/s and 3-6 Mc/s, D/F sets for 165-400 kc/s and 400-1000 kc/s with choice of 3 systems, Lorenz blind-landing equipment and intercommunication audio amplifier units. The unit system of assembly is widely used and diecast frameworks are a prominent feature. Only 2 kinds of valves, one for transmitting, the other for all receiving functions, are used, and the loop aerial for D/F is an iron-dust cored coil of small dimensions. The equipment weighs 385 lbs. (a-3, b-1, c-1, d-5, e-0, f-Description)

1253. ANONYMOUS, "Description of C. R. Direction Finding Receiver No. RRS 1726 for Frequencies of 20 to 60 Mc/s," Naval Electronics Laboratories, National Physical Laboratory (British) Report, (CRB:41.384); 14 November 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1254. ROSS, W., AND HOPKINS, H. G., "Effects of Barrage Balloons Cables on Radio Direction Finding," National Physical Laboratory (British) Report No. RRB/C. 14; 21 November 1940. ABSTRACT: With the installation of a barrage of twenty-four captive balloons at from one to three miles from the Radio Research Station, Slough, the opportunity has been taken to ascertain the effect of the cables attached to these balloons on bearings observed on a radio direction finder. Observations were made on signals in the frequency band 6-20 mc/s, (wave-lengths 15-50 metres) and also on 30 Mc/s (10 metres). In the short wave band mentioned the effect depended upon whether the signals concerned originated at a distant or nearby transmitting station, i.e., whether the received signals were due mainly to ionospheric rays or to direct or ground waves. In the former case the variations in observed bearings due to changes in ionospheric conditions were only slightly increased by the presence of the balloon cables. When bearings were taken on the direct rays from a transmitting station situated only 10 miles from the direction finder, the observed bearings which were steady to ± 1 in the absence of the balloon cables were subject to variations of ± 10 when the balloons were elevated. In the latter case, the observed bearings were always wandering about due undoubtedly to the continually changing positions of individual cables. These results obtained on a frequency of 7 Mc/s (43 metres) were supplemented by additional observations on a frequency of 30 Mc/s (10 metres) taken on a transmitting station at a distance of about 8 miles from the direction finder. In this case the bearings, which were constant to within ± 0.5 in the absence of the balloons, were subject to variations of ± 7 to ± 30 depending upon whether the balloons were flying at a low or full height. A short discussion included in the paper indicates that all these results are consistent with an explanation based upon the interfering effects of re-radiation from the balloon cables regarded as aerials, long compared with the wave-length in use. (a-1, b-3, c-1, d-5, e-226, f-D/F errors)

1255. KIHN, H., HARVEY, R. L., AND O'NEIL, J. J., "Loop Antennas with Ferromagnetic Cores," Radio Corporation of America, Camden, New Jersey, Report TR 813; 22 November 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1256. ANONYMOUS, "Instrument Landing of Aircraft," Elect. Engrn., vol. 59, pp. 495-502; December 1940. See also Engineer, London, vol. 171, pp. 255-256/271-272; April 1941. ABSTRACT: Describes the so-called Indianapolis System employing uhf radio waves (around 100 Mcs) and the higher frequency (750 Mc/s) micro-wave system developed by M.I.T. In each system 4 separate radio transmitters are used, one for lateral guidance, one for vertical guidance and two for position fixes which provide vertical marker beacons. On the airplane three radio receivers are used; one for the localizer beam, one for the glide path beam, and one for the marker beacon signals. The procedure in making a typical instrument landing is described. The article also describes in some detail the equipment on the ground and in the airplanes. (a-3, b-1, c-1, d-1, e-0, f-Description)

1257. ANONYMOUS, "Simon Radioguide - Instruction Book Model 'P'," Radio Navigational Instrument Corporation, New York City; December 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1258. ANONYMOUS, "Symbols for Radio and Direction Finding Equipment," (German: LHS) See: Department of Commerce PB56826; December 1940. ABSTRACT: This instruction manual shows symbols used for radio and direction finding devices. Each symbol is explained by diagrams. General directions are given. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Reference)

1259. FOLSCHE, T., AND OSKEN, H., "Wind Velocities at High Altitudes Measured by Radio Direction Finding Equipment of the Adcock System," (German: D.-S) See: Air Document Index No. R V085 F; December 1940. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1260. WIRKLER, W. H., "Effect of Ground System and Power Cable on Direction Finder Site," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 104; 3 December 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Error)

1261. MOORE, C. B., "Test of Hallicrafter Direction Finder Model S-30 (Frequency Range 220-3000 Kc)," Signal Corps Engineering Laboratories, Monmouth, Report No. 730 (Coles: D/F Group); 12 December 1940. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

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1262. ANONYMOUS, "Description of Artillery Fire Control Installations for 'Prinz Eugen' Master Direction Finder," (German: O.K.M.); OP-32-F2-0-3358-46; 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1263. ANONYMOUS, "Instruction Book for Model DU-1 Aircraft Radio Direction Finding Equipment, Frequency Range 200 to 1600 Kcs," U.S. Navy; NavAer-08-5Q-9; 1941. See Department of Commerce PB14784. ABSTRACT NO. 1: The Model DU-1 Radio Direction Finding Equipment has been designed to take accurate unilateral and bilateral bearings when used in conjunction with Navy radio receiving equipment of the Model RU series. This equipment is intended for installation on open cockpit types of Naval aircraft, such as scouting and observation planes, where all operating controls must be accessible to the pilot or observer. The direction finding frequency range has been designed to cover the range of from 200 to 1600 Kcs in three bands. ABSTRACT NO. 2: It consists of a loop antenna, vacuum tubes, and suitable signal coupling circuits for determining, without ambiguity, the bearing of a radio transmitting station when the equipment is used with a suitable vertical antenna. In addition to a detailed description, this report discusses installation, initial adjustments and calibration, operation and maintenance, and includes parts lists, photographs, schematic and wiring diagrams of the equipment. (a_1-1, a_2-3, b-3, c-1, d-1, e-845, f-Instructions)

1264. ANONYMOUS, "Yearbook 1940/1941," (German: D.A.L.) See: Department of Commerce PB25253; 1941. ABSTRACT: This yearbook was published by the German Academy of Aeronautic Research and contains introductory material by various German scientists and industrialists connected with German aviation. It also presents the biographies of well known German members of the academy. Furthermore it contains a bibliography of literature connected with aviation and which was published by its German members in previous years. The scientific part of this yearbook contains lectures given by members of the academy during the scientific sessions of the session period 1940/1941. The following problems were discussed at the sessions and are presented in the yearbook in the form of abstracts:... (10) Disturbances in radio communication and its removal, by A. Esau. (11) Radio disturbances in aviation, by Heinrich Viehman. (12) On disturbances in the radio operation of the DVL, by Rudolf Stüssel. (13) Basic and practical problems of ionosphere research, by J. Zenneck.... (20) Electromagnetic reflection: its technique, possibilities and limits, by Wilhelm Runge. (21) Meteorological navigation, by Heinrich Seilkopf.... (30) On radiosonde direction finding with electrical altimeter, by Max Dieckmann.... (35) Collective activities. Report by the supervisors. (a) Combustion problems, by Ernst Schmidt. (b) Stratospheric research, by Walter Georgii. (c) Ionospheric research, by J. Zenneck. (d) Aviation medicine, by Hermann Rein. (e) Aerodynamics and gun research, by Albert Betz.... (a-3, b-1, c-4, d-1, e-0, f-Yearbook)

1265. ALPERT, J. L., MIGULIN, V. V., AND RYASIN, P. A., "Investigation of the Phase Strycture of the Electromagnetic Field and the Velocity of Radio Waves," J. Phys. U.S.S.R., 4, 1-2, pp. 13-38; 1941. ABSTRACT: Starting from Sommerfeld's solution for the field of a vertical dipole at the surface of the earth, the authors compute the variation of the space phase of the Hertzian and vertical electrical force vectors as a function of distance, frequency, ground conductivity, and dielectric constant of the medium. The phase velocity can then be graphed against the distance. It is shown that, beyond the induction region, this velocity is lower than c and, as the distance increases, asymptotically approaches c. Phase/distance characteristics are calculated for the 2-frequency interferometer used in the experimental work. The dispersion interferometer measures the difference in the optical path lengths of 2 waves of different frequencies and comprises 2 transmitters (2f and 3f) at one location and 2 receivers at another. The phases of the receiver outputs are compared on a c.r. tube via Lissajous figures (accuracy 1°-2°). A phase deviometer or dummy transmitter is used to check receiver phase shift and is described. The radio interference distance meter is a reflection system which measures the sum of the optical path lengths of the 2 transmitted signals. Experiments with the dispersion interferometer were inconclusive and contradictory, but tended to bring out that the dispersion was low and often masked by diffraction effects. More successful results were obtained by the reflection technique and these agreed with the theory. It is claimed in consequence that Zenneck's theory of plane waves and Sommerfeld's theory of surface waves are not compatible with experimental data. The work was done on medium waves. (a-5, b-1, c-2, d-2, e-0, f-Theory and experiment)

1266. BUDENBOM, H. T., "Azimuth Indicator for Flying Fields," Bell Lab. Record, vol. 20, p. 58; 1941. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

1267. BUSIGNIES, H., "Mountain Effects and the Use of Radio Compasses and Radio Beacons for Piloting Aircraft," Elect. Comm., vol. 19, no. 3, pp. 44-70; 1941. ABSTRACT NO. 1: Errors and fluctuations in the indications obtained with loop radio beacons and vertical antennas in D/F are examined, and it is shown that the results of calculation are in accord with the phenomena observed. A fairly complete mathematical analysis of errors observed at short distance (2λ or less) from loop radio beacons is given, and interference phenomena due to reradiators (mountains, etc.) are described and discussed. ABSTRACT NO. 2: A report on tests made on the combined use of radio beacons and compasses by observations on board the flight research plane of United Air Lines, between Salt Lake City and Chicago. The theory of D/F errors to be expected within a few wavelengths of the transmitter is considered carefully, and it is shown that, while these errors are of a similar nature whether the transmitter uses a loop or an open aerial system, they are considerably worse for a loop. In particular, rapid changes in indicated direction are to be expected as a plane passes over a station. These deductions are checked during the flight. On passing over the Rocky Mountains large and variable errors are found, due to reflections of the beacon beam, as was previously observed in the Alps. Some of the deductions are also tested with small-scale apparatus using uhf transmission. The advantages of the beacon-compass combination lie in the greater ease with which a pilot can return to the beacon course after having deviated from it. It is considered improbable that the mountain effect would be reduced by using higher frequencies. (a_1-6, a_2-3, b-1, c-1, d-1, e-48, f-Study)

1268. CLARK, N. J., "Aircraft Directional Instruments," Western Flying, vol. 21, p. 272; 1941. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1269. CROOK, W. E., D/F Handbook for Wireless Operators, Pitman; 1941. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Book)

1270. ECKERSLEY, T. L., AND FARMER, F. T., "Short-Period Fluctuation in the Characteristics of Wireless Echoes from the Ionosphere," Proc. Roy. Soc. Series A., vol. 177, p. 82; 1941. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

1271. FRIAUF, J. B., "Nomograms for the Solution of Spherical Triangles," Journ. Franklin Inst., vol. 232, p. 151; 1941. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

1272. GARDINER, E. L., "Compressed Dipoles: Reducing Dimensions of Short Wave Aerials Used in Direction-Finding on Ultra-Short Waves," Wireless World, vol. 46, pp. 453, 501; 1941. ABSTRACT: It is shown how the physical dimensions of short-wave aerials may be reduced by insertion of a loading coil. Measurement of the relative effectiveness of normal and loaded aerials were made by the author and are described. The matter is treated mainly from the point of view of reception. (a-1, b-1, c-1, d-5, e-0, f-Description)

1273. GIBBONS, R., "Automatic Direction-Finding: Principles of Aeronautical A-D-F Systems," Q.S.T., vol. 25, p. 48; 1941. ABSTRACT: A device called the radio compass was introduced to air navigation in about 1932. This was a true name for the device because it consisted of a pointer which pointed at all times to the radio station tuned in on the system rather than to magnetic north. The principle of this device, briefly, is as follows: If both a loop antenna and a vertical (non-directional) antenna are connected to a radio receiver through suitable coupling devices and phase-shifting networks, the resulting field pattern is a cardioid. If the connections of the loop (or vertical antenna) are reversed, the resulting pattern will still be a cardioid but with the null rotated 180°, the maximum signal will now come in along the line that previously gave minimum response. The radio compass consisted of a radio receiver to which was connected a zero-center output meter and electronic switching for simultaneously reversing the polarity of the meter and the polarity of the loop antenna. If the radio station were located directly ahead, reversing the loop connections would not increase or decrease the amount of receiver output and hence the needle would not deflect. If, however, the station were located to the right or left the pickup would be greater with one loop connection than the other and the needle would deflect in the corresponding direction. This device was not particularly useful to the pilot because it didn't tell him where he was but only whether he was headed towards the radio station. A strong cross-wind would make him fly a course considerably different than the direct route, and this is very undesirable from the standpoint of commercial operation. A few years ago someone conceived the idea of adding electrical contacts (in effect) to either side of the loop movement, these contacts in turn to close the circuits of an electric motor that would rotate the loop. The position of the loop could then be indicated on an azimuth scale. Thus if the station is to the right or left of the plane, when the signal is tuned in the loop will rotate until the meter is returned to zero, and the position of the loop, as indicated on the azimuth indicator, gives the bearing of the radio station from the plane. This device, as contrasted with the radio compass, is extremely useful to the transport pilot. By tuning in two stations the pilot can plot bearings and obtain a "fix," i.e., calculate his position. If he is already on a radio course a single bearing will give this fix. An ADF system consists of a loop antenna, a loop amplifier and 90° phase shifter, an electronic switch (it looks something like a balanced modulator), a non-directional antenna, a sensitive and selective receiver, a thyratron (grid-controlled rectifiers) azimuth control circuit and an audio oscillator. The loop antenna is directional in that the voltage induced in the loop is maximum when the plane of the loop is turned towards the transmitter and is zero when the plane of the loop is perpendicular to the line from the transmitter. The resultant of the voltage induced in the loop is 90° out of phase with the voltage induced in the vertical antenna and changes abruptly 180° as the loop is rotated through the position of zero pickup. The voltage from the loop is amplified and shifted through 90° so that it is either in phase with, or in phase opposition to, the voltage induced in the vertical antenna, depending upon which edge of the loop is turned towards the transmitter. The voltage from the loop amplifier is then fed into the electronic switch stage. The circuit of this stage looks somewhat similar to a balanced modulator stage, where two tubes are connected in push-pull with an additional coupling circuit in the common grid return. The output of the loop amplifier is fed into this common grid circuit and the output from an audio oscillator is fed to the grids in push-pull. The result is that, depending upon the polarity of the voltage from the audio oscillator, one tube amplifies during part of half of the audio cycle and the other tube amplifies during part of the other half of the audio cycle. The plates of the two tubes are connected in push-pull through a tuned circuit and, because of the switching action through the two tubes, the phase of the current in this circuit will reverse in accordance with the audio oscillator. From the electronic switch stage the loop signal is combined with the signal from the non-directional antenna and amplified and detected in a regular receiver circuit. The output signal from the receiver is impressed in parallel on the grids of the two thyratrons are fed in push-pull by the audio oscillator and, depending upon which way the loop is turned, the phase relation determines which of the thyratrons will fire and thus which way the loop will turn. When the loop is broadside to the direction of the radio station, the difference or resultant is zero and the motor does not operate. The circuits are arranged so that if the radio signal is coming from the left the modulation is such that the indicator points to the left, and if the radio signal is from the right the pointer turns to the right. The directional accuracy of the ADF system is excellent under normal conditions, but there are several factors influencing its accuracy under adverse conditions. Crash static has little or no effect except to cause a spurt of a few degrees in one direction or the other during the crash or crashes. However, thermal or heat lightning, because of its more continuous nature, offers a greater problem. During intense conditions, when the discharge is almost continuous, the pointer may tend to swing away from the station and towards the direction of the center of the thermal static agitation. Swings up to plus or minus 90° have been observed. (a-1, b-1, c-1, d-1, e-0, f-0)

1274. GOTHE, A., AND KUMMICH, R., "Adcock Aerials with Wooden Masts: Elimination of Errors Due to Varying Conductivities of Parts of Wood," Hochf: tech. u. Elek: akus., vol. 55, p. 199; 1941. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Description and test)

1275. NORTON, K. A., "The Polarization of Downcoming Ionospheric Radio Waves," U.S. Bureau of Standards Report No. 60047; See also Department of Commerce PB 15963; 1941. ABSTRACT: In the use of radio direction finders errors in bearings are due in part to polarization of downcoming ionospheric radio waves. These waves have components polarized both parallel and perpendicular to the plane of incidence and with random relative phases. This report studies the polarization of the downcoming waves before they reach the earth's surface, and also the modification of the polarization thus achieved by ground reflection before they contact the direction finder. The problems arising when testing a direction finder by means of fields transmitted from a source at a comparatively short distance away are discussed. Drawings, curves, and formulae help to explain the report. (a-3, b-3, c-1, d-1, e-278, f-Propagation)

1276. SCHULE, F., "Double-Loop Direction-Finding with Cathode-Ray-Tube Indication; Direction-Finding Free from Night Error," Hochf: tech. u. Elek: akus, vol. 57, p. 96; 1941. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Description)

1277. BURROWS, C. R., AND GRAY, M. C., "The Effect of the Earth's Curvature on Ground Wave Propagation," Proc. IRE, vol. 29, pp. 16-24; 1941. ABSTRACT: Curves are presented for the rapid calculation of the ground wave for radio propagation over a spherical earth of arbitrary ground constants, antenna heights, and polarization. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

1278. FIEBER, "The Connection of Direction Finding Equipment to Simple Automatic Course Control," See Air Document Index No. R2159 F660; January 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1279. GEORGII, W. J. O., "Observations Regarding Direction Finders and Airplane Icing in the Troposphere and Lower Stratosphere," See Air Document Index No. R3253 F1038; January 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1280. PAESLER, M., "The Loaded Goniometer," Hochf: tech. u. Elek: akus, vol. 57, pp. 14-6; January 1941. See also Wireless Engineer, vol. 18, p. 297; July 1941. ABSTRACT: This is a report of a study of the voltage vs. angle characteristics of a loaded search-ing coil to find if it is permissible to halve the reading between two points on either side of a flat minimum (points of equal strength). A special circuit for the experimental investigation is described and the theory is given. It is proven that the characteristics follow a sine law in the loaded condition as well as in the unloaded condition. (a-6, b-1, c-4, d-4, e-0, f-Experimentation)

1281. ANONYMOUS, "Radio in Wartime," Engineer, vol. 171, no. 4436, pp. 48-49; 17 January 1941. ABSTRACT: Editorial discussion, with particular reference to radio direction finding. (a-3, b-2, c-1, d-5, e-0, f-Discussion)

1282. ANONYMOUS, "Calibration Curves for Radio Direction Finding

Receiver of Peil-G. V Test Model EZ. 2," See Air Document Index No. R208 F859; February 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1283. ANONYMOUS, "Description and Operating Instructions for Goniometer," See Air Document Index No. R2114 F146; February 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instruction)

1284. ALFORD, A., "Coupled Networks in RF Circuits," Proc. IRE, vol. 29, pp. 55-70; February 1941. ABSTRACT: After emphasizing the inadequacy of the common view of magnetic coupling between, say, open-wire lines, the theory of interaction between conductors in electric fields is given and applied to the following cases, fields due to induced currents being neglected: (1) Currents induced in a wire situated in a parallel electric field $E = E_0 \cos \omega t$; (2) currents induced in the same wire when inclined to the field; (3) a long wire running through the region near a radiating network and terminated with its surge impedance; (4) current in a long wire close to an energized 1/2-wave aerial. The results differ in some respects from those found by the method of Pistolkors. Allowing for the effects of induced currents, couplings between a long open line and a 1/4-wave section and between 2 terminated lines shorted at their near ends are considered. The principles of reradiation and the theory of coupled section filters and of open sections as impedance transformers are considered. (a-3, b-1, c-1, d-1, e-0, f-Experiment and theory)

1285. BREUNINGER, H. W., "A Three-Mast Adcock Direction-Finder," Hochf: tech. u. Elek: akus, vol. 57, p. 57; February 1941. See also Wireless Engineer, vol. 18, p. 297; July 1941. ABSTRACT: Since D/F is a planar problem and a plane is determined by three points, the direction of arrival on an electromagnetic wave must be determinable from voltages produced by the wave in three antennas not along a straight line. A short discussion of errors at the goniometer is given, and the conclusions reached are: the three-mast Adcock system has a systematic error vanishing for twelve azimuths, compared with one vanishing for only eight azimuths in the ordinary four-mast Adcock. But the blurring of the minimum makes the three-mast system definitely inferior to the four-mast system for short waves. (a-6, b-1, c-4, d-4, e-0, f-Descriptive analysis)

1286. HENDERSON, J. T., BELL, J. W., AND SMYTH, H. R., "A Cathode-Ray Direction Finder for Long Waves," Nat. Res. Council of Canada, no. 928; February 1941. See also Wireless Engineer, vol. 18, p. 427; October 1941. ABSTRACT: Equipment primarily for marine application: description: results, including tests with signals from airplanes, using loop and Adcock antennas. (a-6, b-3, c-1, d-7, e-0, f-Description and experimentation)

1287. HUBER, W., "AC-Operated Motion Picture Camera Accessory for Bearing-Angle Oscillograph Type 164/165," See Air Document Index Report No. R4024 F688-695; February 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1288. ROSENKRANZ, E., "Comparative Investigation of a Target-Flight Receiver and an 'Energy-Comparison' Direction Finder," Hochf: tech. u. Elek: akus, vol. 57, pp. 47-54; February 1941. See also Wireless Engineer, vol. 18, p. 296; July 1941. ABSTRACT: The target-flight receiver depends on the combination of a loop and an auxiliary aerial. When the voltages from antennas are equal, the theoretical characteristic is made up of two cardioids. A modification works on the energy-equality point of a crossed-loop energy is available. Proper use of the pattern produces unambiguous direction indication. (a-6, b-1, c-4, d-4, e-0, f-Description)

1289. NORTON, K. A., "Ground Wave Propagation," Fourth Annual Broadcast Engineering Conference; 10-21 February 1941, sponsored by the Department of Electrical Engineering, The Ohio State University, with the cooperation of the National Association of Broadcasters. ABSTRACT: Knowledge of the nature of the propagation of radio waves may be obtained in any one of several ways. It is possible to make a very large number of carefully conducted experiments and thus to determine empirically the physical laws relating the various variables involved such as, for example, the intensity of the waves, the distance, the frequency, etc. Or it is possible to determine the exact solution of Maxwell's electromagnetic equations on the assumption that the actual complex conditions to be encountered in practice may be replaced by certain idealized boundary conditions as, for example, the assumption that the surface of the earth is exactly spherical and consists of an electrically homogeneous material with uniform conductivity and dielectric constant throughout. In general, both of these methods may be used to advantage. For example, the theoretical solutions of the idealized problem provide the experimenter with ideas for correlating his data, make possible the extrapolation of data beyond the range of the measuring instruments, and aid the engineer in planning for the optimum use of the various frequencies in the spectrum. In most problems the engineer is not interested in the value of the field intensity at a particular point; instead, he requires the average field over a considerable area. In many cases the theory can predict these average fields with sufficient accuracy; in other cases, where the terrain is very rugged or where there are large variations in ground conductivity over the path, it is necessary to make radio measurements in order to obtain an accurate quantitative picture of the results to be expected of a given radio installation. This failure of the theory to give accurate quantitative results in these cases is not necessarily due to any inaccuracies in the theory but rather is due to the fact that it is practically impossible to develop a theory which will take into account the complicated boundary conditions sometimes found in practice. However, in other cases, because of their greater simplicity, approximate theoretical formulas are frequently used and are often misused by applying them to problems outside their region of validity. In the first part of this discussion an attempt will be made to present a broad outline of the nature of ground wave propagation. Incidental to this outline, various approximate formulas will be given and emphasis placed upon their ranges of validity. In the second part, examples will be given of graphical and other methods for obtaining the exact solution of the idealized boundary problem of an electrically homogeneous spherical earth. (a-1, b-3, c-1, d-1, e-227, f-Theory)

1290. WIRKLER, W. H., "Performance Test Procedure for High Frequency Direction Finder," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 106; 25 February 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1291. WIRKLER, W. H., "Radio Direction Finder," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 105; 25 February 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1292. ANONYMOUS, "Report 1: Section on Project II," Massachusetts Institute of Technology, Radiation Laboratory Report II-I. See Department of Commerce PB L58065; March 1941. ABSTRACT: This report discusses the development of a radio echo direction- and range-finding system using the principle of conical scanning. The precision desired in angular measurement was from 1/5 to 1/10 degree and in range ± 30 yards. The working range of the system was to be an entire hemisphere in angle and of the order of 10 or 15 miles in range. Automatic guiding in direction was to be provided. This report covers work done on this project up to Mar. 24, 1941. Graphs and drawing included. (a-3, b-3, c-1, d-1, e-0, f-Survey)

1293. SCHURER, J., "Direction Finder Recording Apparatus C 243 - C 244," See Air Document Index No. R4024 F738-748; March 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1294. ANONYMOUS, "Short Wave Direction Finders with Cathode Ray Oscillograph Indicator," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 101; 27 March 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1295. ANONYMOUS, "Models DQ-5 and DQ-6 Radio Direction Finder Equipment," RCA, Victor Division, Camden, N. J., Instruction Book IB 38115. See also Department of Commerce PB17883; April 1941. ABSTRACT: This publication describes above equipment and includes instructions for installation, operation and servicing. The equipment is designed to operate from 115 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, of any frequency within this band. Photographs, drawings, and schematic wiring diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1296. ANONYMOUS, "Models DP-12 and DP-13 Radio Direction Finder Equipment, Frequency Range 100 - 1500 KC., AC. Operation," Radio Corporation of America, Camden, N. J., Instruction Book No. IB 38114. See also Department of Commerce PB17766; April 1941. ABSTRACT: These instructions cover the installation, operation and

servicing of the Direction Finder Equipment specified above. This equipment is designed to operate from 115 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The receivers for these equipments have an antenna input protective relay and neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use. The neon protective device bypasses high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. An electronic output indicator also has been added, which aids in taking bearings on C-W signals. Other minor mechanical features have been improved. A shielded transmission line, loop output junction box, and receiver input transformer are supplied for connection between the loop and the receiver. The transmission line must be cut to a suitable length when it is installed. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1297. BACHEM, C., "Apparatus for Improvement of D.F. with Symmetrical Dipole Antenna Groups," Air Document Index No. R4024 F757-773; April 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1298. BUSIGNIES, H., "Control of Night Errors in Airplane Direction Finding," Proc. IRE, vol. 29, p. 222; April 1941. ABSTRACT NO. 1: Abstract of paper presented at IRE Summer Convention, 1941. Consideration is given to development of a method enabling pilots to determine accuracy of night bearings in the range 200-2000 meters. It is demonstrated that the night error is smaller in the air than on the ground. Also, that there are regions in the atmosphere where the night error is very small. ABSTRACT NO. 2: This paper describes the development of a method enabling pilots to determine the accuracy of night bearings obtained by means of a radio compass in the wavelength range of 200 to 2000 meters (150 to 1500 kilocycles), and the effect on the indication when the plane passes through the combination of fields due to the reflection of waves from the E layer or from a mountain side. Consideration is given to the appearance of the night error on the ground and in altitude, taking into account the simultaneous presence of (1) the direct wave; (2) the sky wave; and (3) the sky wave reflected from the ground. It is demonstrated that the night error is smaller in the air than on the ground; also that there are regions in the atmosphere where the night error is very small. The dynamic aspect of the night error is then studied in the case of a plane moving through the above-mentioned system of waves. How the radio-compass indication changes regularly about a mean value, whether correct or not, according to the polarization of the sky wave, is next discussed. All cases of polarization are examined. In conclusion, a number of rules are formulated relative to night direction finding on board airplanes above land or sea, supplemented by maps showing areas where direction finding is safe, unsafe, or dangerous. The maps show that the practical range of night direction finding is increased substantially by the correct interpretation of the radio-compass indications. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Theoretical study)

1299. GORDON, R. A., "Test of Lucite Loops," USN, NRL Report No. R-1726. See Department of Commerce PB120594; April 1941. ABSTRACT: 31 pages of photos drawings, graphs and tables discussing tests on a lucite direction finding loop. (a-3 and 4, b-3, c-1, d-1, e-0, f-Test report)

1300. HUTTMANN, E., "Double-Loop Arrangement for Direction Finding on Short and Ultra-Short Waves," Hochf: tech. u. Elek: akus, vol. 57, p. 122; April 1941. See also Wireless Engineer, vol. 18, p. 427; October 1941. ABSTRACT: Second loop disconnected from receiver, coupled to first loop to eliminate abnormally-polarized field component. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1301. JOHNSKE, F., ET AL., "Arrangement for the Automatic Clearing of the Minimum in a Rotating Direction Finder," Hochf: tech. u. Elek: akus, vol. 57, p. 123; April, 1941. See also Wireless Engineer, vol. 18, p. 428, October 1941. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, d-0, f-0)

1302. KOSCHMIEDER, K., "U-Type Adcock System with Aerials Connected to Ground or Counterpoise," Hochf: tech. u. Elek: akus, vol. 57, p. 122; April 1941. See also Wireless Engineer, vol. 18 p. 428; October 1941. ABSTRACT: The transmission line is raised so that the fields due to horizontally polarized rays between the line and the earth and between the line and the antenna cancel out. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1303. MULLER, E., "Arrangement for the Compensation of Periodic Errors in d-f," Hochf: tech. u. Elek: akus, vol. 57, p. 122; April 1941. See also Wireless Engineer, vol. 18, p. 428; October 1941. ABSTRACT: Field coils of goniometer automatically displaced with respect to search coil, by eccentric or contoured discs. (a-6, b-1, c-4, d-4, e-0, f-Description)

1304. SANDRETTO, P. C., "Ground-Station Direction-Finding," Aviation, vol. 40, pp. 42-43, 150; April 1941. ABSTRACT: Europe and United States have employed two different systems of air navigation; in possibility that navigation by triangulation will be used in United States as in Europe. United Air Lines has been studying equipment for most efficient operation. (a-3, b-2, c-1, d-1, e-0, f-0)

1305. ISELY, F. C., "Test of Underwater Reception of Low Frequency Radio Signals," NRL Report R-1717; 1 April 1941. ABSTRACT: The object of the test herein reported was to investigate the practicability of equipping submarines with means and equipment to receive low frequency transmissions while completely submerged. To determine this, it was necessary to make the following tests: (a) The signal strength and signal-to-noise ratio received by various types of antennas at various depths and for various frequencies; (b) The best type of coupling device (input transformer and tuning unit) to transfer the received signals from the antennas to the receiver equipment. In order to obtain other pertinent information, other tests were made as follows: (1) Underwater bearing of transmitter by null method; (2) "Q" of loops; (3) effect of sea bottom on signals; (4) noise survey of ship. (a-1, b-3, c-1, d-1, e-146, f-Test and analysis)

1306. ANONYMOUS, "Effects of Closed Electrical Loops upon MF/DF Performance," USN Naval Yard, Puget Sound, Report No. RS3A472A; 14 April 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

1307. ANONYMOUS, "Tests of Lucite Loops," USN NRL Report No. R-1726; 25 April 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1308. BARFIELD, R. H., AND ROSS, W., "A Guide to the Use of Radio-Direction Finding on Short Waves (Wavelength 10 - 100 M.)" National Physical Laboratory (British) Report No. RRB/c.23; BCSO: 79-B1-2(Coles: D/F Group); 30 April 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1309. ANONYMOUS, "Base Synchronism," See Air Document Index No. R2301 F587; May 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1310. BURGESS, R. E., "Noise in Receiving Aerial Systems," Proc. Phys. Soc. (London), vol. 53, pp. 293-304; May 1941. ABSTRACT: Several authors have investigated theoretically and experimentally the signal/noise ratio in receiving aerial systems, but the problem of the validity of Nyquist's theorem for radiation resistance has hitherto not been satisfactorily resolved. The problem is here discussed, and it is concluded that (i) for an aerial in an enclosure at uniform temperature, the radiation resistance is at that temperature from the point of view of noise, and thus (ii) for an aerial in free space, no noise originates in the radiation resistance. These results are shown to be consistent with the Rayleigh-Jeans radiation law, while the quantum-theory form of Nyquist's equation leads to the Planck radiation law. The estimation of the noise occurring in practical aerial systems is discussed, consideration being given to the various external noise fields, viz. thermal radiation, Jansky noise, atmospherics. The actual noise received may be expressed conveniently by the equivalent temperature T_r of the radiation resistance. The general problem of evaluating the signal/noise ratio for any values of received circuit- and valve-noise is analysed and a criterion (K) of efficiency of an aerial system is deduced. The paper concludes with a numerical calculation of the performance of (1) a vertical aerial inductively coupled to a tuned-grid circuit and (2) a tuned-loop aerial, which are typical examples of an efficient and an inefficient system respectively. (a-1, b-1, c-1, d-5, e-582, f-Basic theory)

1311. HELL, R., "Elimination of Night Error," Hochf: tech. u. Elek: akus, vol. 57, p. 141; May 1941. See also Wireless Engineer, vol. 18, p. 468; Nov. 1941. ABSTRACT: Errors eliminated by means of a completely-closed loop divided into two halves by vertical conductor (coupled to receiver) whose antenna effect is neutralized by a differential condenser to ground. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1312. JORDAN, E. C., "Acoustic Models of Radio Antennas," Ohio State University - Eng Experiment Station, Bulletin No. 108, vol. 10, no. 3; 3 May 1941. ABSTRACT: Use of acoustic models for investigating directional characteristics of antenna arrays; description of experimental setup; comprehensive discussion of directional antenna arrays; mutual impedance measurements; directive sound equipment and its application. (a-3, b-3, c-1, d-1, e-0, f-Study)

1313. SHTILLERMAN, L. E., "The Problems of New Systems of Radio Navigation," Elektrosvyaz, no. 5, pp. 24-28; May 1941. See also Science Abstracts, vol. 46, p. 17; January 1943. ABSTRACT: The article deals with new methods of radio navigation, which show the courses in every direction without being influenced by the so-called night effect. The main questions connected with the solution of such problems are analyzed, and errors likely to occur in working out and applying the explained systems are discussed. (a-6, b-1, c-2, d-2, e-0, f-Survey and analysis)

1314. SMITH-ROSE, R. L., AND ROSS, W., "Note on the Application of Pulses to Short Wave D/F," National Physical Laboratory (British) Report No. RRB/C.24, (BCSO:79-B1-3); 1 May 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1315. MALLING, L. R., AND FREEMAN, R. L., "Assembly and Operating Instructions for Radio Sets SCR-555 (18 - 65 Mc/s, Radio Direction Finder)," Haseltine Corporation, Report No. 1204W (Coles: D/F Group); 22 May 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1316. BAISDELL, H. L., FREEMAN, R. L., AND TYSON, B. F., "Technical Report on Radio Set SCR-556 (65 - 140 Mc, Radio Direction Finder)," Haseltine Corporation, Report No. 1205W (Coles: D/F Group); 24 May 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Technical report)

1317. ANONYMOUS, "Descriptive Specification Model CXAL Direction Finder," Collins Radio Corporation, Cedar Rapids, Iowa, Report: CDS; 31 May 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

1318. ANONYMOUS, "Peil G V," (German: L.N.S.) See: Department of Commerce PB56766; June 1941. ABSTRACT: The article contains circuit diagrams of the Peil G V, and airborne radio direction finding and homing device. (a-4, b-3, c-4, d-4, e-0, f-Description)

1319. GROSSKOPF, J., AND VOGT, K., "On Observations of the Doppler Effect in the Short-Wave Reception Field," Hochf: tech. u. Elek: akus, vol. 57, pp. 143-146; June 1941. See also Wireless Engineer, vol. 18, p. 458; 1941. ABSTRACT: Theoretical study of waves re-radiated by a moving aircraft. Study of the Doppler effect and derivation of formulas which give beat-frequency note between such waves and the original waves. The theory was tested by a great number of experiments, and curves are given to explain those results. (a-6, b-1, c-4, d-4, e-0, f-Theoretical study)

1320. WALSH, C., "Braniff Airways Installs Direction Finder," Aviation, vol. 40, p. 81; June 1941. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1321. CASE, N. P., AND HERSHEY, L. M., "Technical Report on Radio Set SCR-504-T1 (100 Kc. to 65 Mc. Portable Direction Finder)," Hazeltine: 2150 (Coles: D/F Group); 23 June 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1322. ANONYMOUS, "D/F System Bomber Command General (M. F.)," Telecommunications Research Establishment, Ministry of Supply (British) Report No. T.1206; 25 June 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1323. ANONYMOUS, "Models DP-14, 15, 16, and 17 Radio Direction Finder Equipment, Frequency Range, 100 - 1500 K.C.," Radio Corporation of America, Camden, New Jersey: Instruction Book No. IB381238; 28 June 1941. ABSTRACT: These instructions cover the installation, operation and servicing of the Direction Finder Equipment. The Model DP-14 receiver is designed to operate from a filament battery supply of 6 volts dc and a plate battery supply of 100 to 135 volts dc; the Model DP-15 receiver is designed to operate from a 115-volt, 60-cycle, single-phase power source; the Model DP-16 receiver is designed to operate from a 115-volt, 25-cycle, single-phase power source; the Model DP-17 receiver is designed to operate from a 115-volt, 50-cycle, single-phase power source. These receivers are of the superheterodyne type and cover the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction of propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The receivers for these equipments have an antenna input protective relay and neon protective relay and neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use; in addition, the relay in the Model DP-14 receiver contains a normally open contact which acts to open the "B" battery supply circuit. The neon protective device bypasses high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. An electronic output indicator also has been added, which aids in taking bearings on C-W signals. Other minor mechanical features have been improved. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1324. ANONYMOUS, "Model DZ-1 Aircraft Radio Direction Finder Equipment Frequency Range; 15-70 KC and 100-1500 KC, 24V., D.C. Operation," U.S. Navy, NavAer-08-5Q-13; 30 June 1941. See also Department of Commerce PB14922. ABSTRACT: The Model DZ-1 Aircraft Radio Direction Finder Equipment consists essentially of a rotatable loop antenna, a radio receiver, and a dynamotor-filter. It is intended for installation in all types of naval aircraft whose space limitations are such as will permit access for operation of the receiver and loop controls, and which, by absence of closed loops or other obstructions, permits successful direction finding. The equipment is designed for operation from an aircraft's 24-volt battery and serves either for radio reception or direction finding. The loop antenna consist of the Loop Antenna Assembly, Type CRV-69065, and the Loop Drive Assembly, Type CRV-69064. The Loop Antenna Assembly is comprised of two center-tapped, shielded loop windings contained within a streamlined, waterproof housing. One loop winding is mounted inside of the other, and the two windings are so adjusted that their planes intersect at an angle of 90 degrees in order to prevent intercoupling. The inner winding is used for reception on frequencies between 100 kc and 1500 kc, the outer on frequencies between 15 kc and 70 kc. The two windings are rotated as a unit by a central shaft actuated by means of the loop drive assembly. The loop drive assembly consists of an azimuth scale, handwheel and brake assembly, and the loop drive extension. One end of the loop drive extension fastens securely in the base of the loop antenna assembly. The loop antenna is intended to be rigidly mounted on the fuselage of the aircraft, the loop drive extension protruding down through the skin of the aircraft, serving as a support for the loop drive assembly. Bearings are read by means of one of two indices and azimuth scales. The proper index and scale is at all times automatically selected by means of a relay. A vernier drive and brake are incorporated to permit minute adjustment and locking of the loop antennas in any desired position. The Radio Receiver, Type CRV-46123, covers in six bands frequencies between 15 kc and 70 kc and between 100 kc and 1500 kc. On frequencies below 200 kc the selectivity characteristic of the receiver is very sharp, adapting it primarily for the reception of cw or low-frequency or tone-modulated signals. On frequencies between 200 kc and 1500 kc the selectivity characteristic is sufficiently broad to permit reception of either voice or tone modulated signals. The receiver is shock-mounted by means of the Receiver Mounting Base, Type CRV-46087, supplied with the equipment. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1325. ANONYMOUS, "Peil G V, Apparatus Handbook," (German) See: Air Document Index No. R2082 F287; July 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instruction manual)

1326. ADDEY, F., "Long-Distance Position-Finding: Direction-Finding," Journ. P. O. Eng., vol. 34, pp. 94-95; July 1941. ABSTRACT: The article extends the method of calculating the great circle bearing between two stations to give the latitude and longitude of the distant station. (a-1, b-1, c-1, d-5, e-0, f-Bearings)

1327. FRIESEKE and HOEPFNER, "Preliminary Description and Operating Manual for the Automatic Direction Finding Auxiliary Equipment, - Test Model APZ-5," (German) See: Department of Commerce PB 56585; July, 1941. ABSTRACT: This is the technical manual for the auxiliary equipment APZ 5 which, together with the Peil 5, makes up a full automatic airborne G.A.F. radio direction finding system. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Manual)

1328. LUCK, D. G. C., "An Omnidirectional Radio-Range System," RCA Review, no. 6, pp. 55-81; July 1941, and pp. 334-369; January 1942. ABSTRACT NO. 1: Radio navigation may be done with direction-finding receivers on mobile craft, with fixed direction finders on the ground or with directional beacon transmitters on the ground. Each method has its unique merits and faults, but the last seems especially suited for aircraft guidance in the United States and has, in the form of four-course radio "range" beacons, rendered outstanding service. The disadvantages of limited choice of courses and of difficulty in definitely determining on which course a craft may be, inherent in the present four-course ranges, may be avoided by rotating a transmitted radio beam and timing its passage over the receiving craft, to determine uniquely the bearing of that craft from the known location of the beacon transmitter. A rotating beam, of figure-eight shape, may be produced without mechanical motion by setting up two fixed antenna systems, having figure-eight directivity, at right angles and feeding them with radio-frequency signals modulated at the desired rotation frequency, the modulation of the separate supplies to the two crossed antennas being in phase quadrature. Unmodulated carrier to resolve the ambiguity of the figure-eight beam, by changing its shape to a limacon, is radiated from a non-directive antenna, and a timing reference is provided by interrupting all transmission momentarily just as the beam points north. The audio output from a receiver tuned to this beacon comprises a sine wave produced by the sweep of the beam and a train of impulses produced by the reference keying. The sine component is filtered, split in phase and used to drive a cathode-ray beam in a circle, in step with the rotation of the transmitted beam. The impulses are used to slow up the beam electrons momentarily, marking the swept circle with an outward jog and so indicating receiver bearing directly. The impulses also actuate a zero-center meter, while the sine wave renders this meter insensitive at a certain moment of the cycle and oppositely sensitive just before and just after that moment. By adjusting the sine wave phase, the meter may be centered when the receiver is on any desired bearing, and thereafter, will indicate any departure from that bearing. A special broadcast transmission may be used to check adjustments of receiving indicators. Certain conditions as to modulation phases and amplitudes, antenna-current phases and amplitudes, antenna geometry and cathode-ray indicator voltage phases, amplitudes and tube geometry must be fulfilled if accurate bearings are to be obtained. Study of these conditions shows all adjustment tolerances to be of reasonable magnitude, though considerable care in antenna construction is necessary to insure adequate symmetry of antenna-current phase. ABSTRACT NO. 2: The relative merits of radio-range systems, with (a) D/F receivers on the aircraft, and (b) directional beacon transmitters on the ground, are discussed. A new system is described based on modulation wave form multiplexing. It gives direct, immediate and automatic indication of bearing, lays down straight radial courses and stamps each one with a distinguishing number. Experimental ranges have been developed and tested in flight. In each case a radiating system of 5 vertical aerials and a metallic ground mat were used. Each transmitter was of a normal r.t. type, supplemented by a pair of balanced modulators, an impulse keyer and a set of modulation controls. Full monitoring of the effect of all transmitter adjustments was provided. Essentially normal aircraft receivers and aerials were employed, together with c.r. azimuth indicators and pointer-type deviation indicators. (a_1-1, a_2-3, b-1, c-1, d-1, e-0, f-Description)

1329. ROSS, W., "A Practical Rotating Spaced Loop Direction Finder," National Physical Laboratory (British) Report No. RRB/C.34 (BSCO:79-B1-2); 4 July, 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1330. ROSS, W., "Some Observations on the Azimuth of Arrival of Ionospheric Waves Incident at 30° or Less to the Vertical," National Physical Laboratory (British) Report No. RRB/C.37, (BSCO: 79-B2-2); ca 4 July 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Experiment report)

1331. ANONYMOUS, "Antenna Arrangement for Phase Direction Finder," (German) See: Air Document Index No. R2294 F1025; 21 July 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1332. ANONYMOUS, "Aircraft Radio Compass with Cathode Ray Oscillograph Indicator," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 9; 29 July 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1333. ANONYMOUS, "Radio Direction Finder with Fixed Antenna System," (German) See: Department of Commerce PB L70784; August 1941. ABSTRACT: When using fixed antennas for direction finders, errors usually occur due to the fact that the electromagnetic field of the transmittor is distorted by the receiver. The invention proposes to use several D/F antenna systems on a D/F receiver to eliminate errors. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Analysis)

1334. BACHEM, C., "Compensator for Radio Direction Finder Which Permits Automatic Compensation for Waves Arriving from Any Direction," (German D.L.V.) See: Air Document Index No. R2779 F842; August 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1335. JOHNSKE, F., "Equipment for Direction-Finding Free from Night Effect," Hochf: tech. u. Elek: akus., vol. 58, p. 46; August 1941. See also Wireless Engineer, vol. 19, p. 80; February 1942. ABSTRACT: Pulse D/F method applied to observations on telegraphic signals, by cathode ray tube reception with time base controlled by the successive signals. (a-6, b-1, c-4, d-4, e-0, f-Description of a patent)

1336. MENDOZE, E., "Report on Research and Development in Direction Finding for Naval Purposes in the Band 50 - 120 cms," Admiralty Signal Establishment (British): M.370; August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1337. MOULLIN, E. B., AND REYNOLDS, L. G., "Performance of an In-Line Array Combined with an Angle Reflector," Admiralty Signal Establishment (British): M.377; August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1338. ANONYMOUS, "Common Types of D/F Errors and Their Causes," Telecommunications Research Establishment, Ministry of Supply, (British): T.1196; 1 August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1339. ANONYMOUS, "Aircraft Radio Compass with Cathode Ray Oscillograph Indicator," Federal Telecommunications Laboratories, Nutley, New Jersey; 11 August 1941. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-0)

1340. ANONYMOUS, "Report on Further Investigation of D/F Error at Great Bromley," Telecommunications Research Establishment, Ministry of Supply (British); 18 August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1341. BLAISDELL, H. L., AND TYSON, B. F., "Technical Report on Radio Set SCR-556-T2 (65-140 mc Radio Direction Finder)," Hazeltine: 1233W (Coles: D/F Group); 20 August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1342. HERSHEY, L. M., AND FAY, G. S., "Technical Report on Radio Set SCR-504-T2 (100 kc to 65 mc Portable Direction Finder)," Hazeltine: 2155 (Coles: D/F Group); 26 August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1343. PEARCE, R. R., "A Screened Transformer Coupled H Aerial System for D/F on Wave-Lengths between 3 and 6 Meters," National Physics Laboratory (British) Radio Research Board: Report C.38; 26 August 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1344. ANONYMOUS, "Direction Finding Equipment EP 2a," (German L.H.S.) See: Air Document Index No. R2662 F182; September 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1345. BAINBRIDGE, K. T., "Consideration Affecting Choice of Wavelength," Massachusetts Institute of Technology, Radiation Laboratory Report No. V-7S. See: Department of Commerce PB51016; September 1941. ABSTRACT: Some considerations affecting the choice of wavelength for a given job and desired ranges, etc., of RDF systems now in use or under development in the wavelength range from 3 cm to 15 meters, are briefly treated in this report. The considerations presented in this report call attention to the importance of computing and analysing the quality of set performance. Factors such as the estimated power output, target size and aspect, reliable range, "flash" range, frequency of signal amplitude fluctuations, and S/N relative magnitudes for different aspects are discussed. Graphs are included. (a-3, b-3, c-1, d-1, e-0, f-Study)

1346. ELMQUIST, T., AND GUTTON, H., "Radio Location Methods on the Reradiation Principle," Hochf: tech. u. Elek: akus, vol. 58, pp. 71-72; September 1941. See also Wireless Engineer, vol. 19, p. 128, March 1942. ABSTRACT: (I) The cathode ray is deflected in synchronism with the movements of the scanning beam (along two co ordinates) and is modulated in brightness by the reradiated signals. (II) A beat method in which the minimum is read for two neighboring modulating frequencies in succession. (a-6, b-1, c-4, d-4, e-0, f-Description)

1347. McINTOSH, C. H., "Navigation and Direction Finding Loop," Aviation, vol. 40, pp. 52-53, 158, 160, 162; September 1941. ABSTRACT: Principles and use of radio direction-finding loop described and illustrated. (a-3, b-2, c-1, d-1, e-0, f-Description)

1348. KAPLAN, J., "Test of Radio Set SCR-292-T1 (TWA-T1)," Signal Corps Engineering Laboratory, Monmouth, Laboratory Report No. 747 (Coles: D/F Group); 5 September 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1349. ANONYMOUS, "Ionospheric Equipment at Laboratories in Ionosphere-D. F. Project," U. S. Bureau of Standards, Project No. C-1 Report; 12 September 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1350. ANONYMOUS, "Electrical D/F Installation with Automatic Operations," Air Ministry (British) Report: A.I.2G 1340; October 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1351. GERBES, W., "Influence of Direction Finding Errors and Wind upon Target Flying," (German: D.L.F.) See: Department of Commerce PB37673; October 1941. ABSTRACT: This is a report of the "Flugfunk-Forschungs-institut Oberpfaffenhofen". Investigations of this research organization were concerned with effects of target flying about a perpendicular dipole. Direction finding errors, a constant wind on the flying curve, target approach, flight direction, deviation from the direct route and increased flight time were examined. Graphs are included. (a-3, b-3, c-4, d-4, e-0, f-Study)

1352. HOLSTEN, K. G., AND SCHATZEL, W., "Goniometer for Short and Ultra-short Waves," Hochf: tech. u. Elek: akus, vol. 58, p. 104, October 1941. See also Wireless Engineer, vol. 19, p. 181, 1942. ABSTRACT. For such wavelengths the field and exploring coils must be wound with spaced turns. To give a continuous course of the field during rotation, in spite of this, the turns of one coil are inclined at an angle to those of the other coil. (a-6, b-1, c-4, d-4, e-0, f-Descriptive theory)

1353. KRAUTKRAMER, "Research on the Polarization of Radio Waves Reflected from the Ionosphere," (German) Field Information Agency, Technical. Division 677, Report No. 35; October 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Polarization study)

1354. McINTOSH, C. H., "Direction-Finding Navigational Technique," Aviation, p. 54; October, 1941. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1355. WHIPPLE, R. T. P., AND MUGRIDGE, A. H., "Note on the Errors Caused in D/F Bearings by Reradiation from a Vertical Conductor Placed near the Wireless Direction Finder," Admiralty Signal Establishment (British) Report No. M.384; October 1941. ABSTRACT: When the bearings of a distant transmitter are found with a loop aerial direction finder, the bearings in general differ from the true bearings. The errors may be divided into three classes: (1) Site errors, (2) Instrumental errors, and (3) "Night effect" and other atmospheric causes. We are concerned here only with the first class of error and suppose that the incident radiation is vertically polarized. Site errors are caused by reradiation from adjacent objects and are particularly prevalent when a direction finder is mounted on an iron ship. On a ship the external field induces vertical currents in the hull and in masts, etc., and also eddy currents in the hull. The main effect of the eddy currents is to produce a shielding effect, leading to quadrantal error. In this paper we shall consider the errors produced by reradiation from a single vertical mast. At frequencies close to the resonant frequency of, for example, the main serial, that is probably the predominant source of error. It is usual to make a set of "calibration curves" for a ship's direction finder, in which the deviation is plotted against the direction finder bearing at different frequencies. For comparison purposes we have drawn several theoretical calibration curves on the assumption of reradiation from a single vertical antenna. These curves bear considerable resemblance to those obtained in practice. (a-1, b-3, c-1, d-5, e-358, f-Theory. See also Abstract No. 1812, dated December 1943)

1356. WHIPPLE, R. T. P., AND MUGRIDGE, A. H., "On the Representation of a Distorted Electromagnetic Field," Admiralty Signal Establishment (British) Report No. M.385; October 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1357. WHIPPLE, R. T. P., AND MUGRIDGE, A. H., "Re-Radiation from a Vertical Antenna," Admiralty Signal Establishment (British) Report No. M.390; October 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Theory)

1358. ANONYMOUS, "Radio Direction Finding (not R.D.F.)," Central Radio Bureau (British), British Commonwealth Scientific Office Report No. 41/131; 11 October 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1359. ANONYMOUS, "Demountable Short Wave Direction Finder; Instantaneous Indication by Cathod Ray Oscilloscope," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal 103; 16 October 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1360. ANONYMOUS, "Descriptive Literature on Bludworth Marine Direction Finders," National Simplex Bludworth, Inc., New York, N. Y.; 16 October 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1361. BUDENBOM, H. T., "Azimuth Indicator for Flying Fields," Bell Lab. Record, vol. 20, pp. 58-61; November 1941. ABSTRACT: A simplified description of a high frequency, cathode-ray elevated-Adcock D/F is given. Its frequency range is 2-7 mc. The indication is by position of the spot on the cathode ray tube. (a-6, b-1, c-1, d-1, e-0, f-Description)

1362. JANSKY, K. G., "High Frequency Direction Finder Research," Bell Telephone Laboratories, Research Project No. c-16, OSRD 209, NDSrc-'55; November 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study report)

1363. KOTOWSKY, P. ET AL., "Method for the Transmission and Reception of High-Frequency Pulses for Direction-Finding," Hochf: tech. u. Elek: akus, vol. 58, p. 150; November 1941. See also Wireless Engineer, vol. 19, p. 224; May 1942. ABSTRACT: Alternate wide and narrow pulses with the same fundamental frequency, or periodic groups of narrow pulses, are sent out and the band width of the receiver, during the tuning-in to the transmitter or during the synchronizing of the indicating c-r oscillograph, is made so narrow that it only just suffices for the reception of the wide pulse, or group of pulses, so that interference is largely eliminated. After completion of the tuning, the band width is increased enough to allow the reception of the narrow pulses also; the interference will then be increased similarly, but the pulses will stand out from them better... (a-6, b-8, c-4, d-4, e-0, f-Description, patent)

1364. LUCK, D. G. C., AND NORTON, L. E., "Study of a Wave Collector for Semi-Portable Radio Direction Finders Operating Between 2 and 30 Megacycles," Office of Scientific Research and Development, OSRD Report No. 211. See also Department of Commerce PB L87763;

November 1941. ABSTRACT: A mobile Adcock antenna system for high-frequency use, with demountable counterpoise, was constructed and field tested to determine the counterpoise requirements for accurate operation with downcoming waves. Radial wires counterpoises were found unsatisfactory even with ground waves because of insufficient shielding of antennas from nearby objects. A combination of wire netting and radial wires was satisfactory with ground waves but still showed excessive polarization errors with downcoming waves. RCA Research Laboratories, Camden, N. J. (a-3, b-3, c-1, d-1, e-0, f-Description)

1365. McINTOSH, C. H., "Position Fixes by Direction-Finding Bearings," Aviation, vol. 40, no. 11, pp. 72-73, 162, 164, 166, and 168; November 1941. ABSTRACT: Basic requirements for instantaneous fix; practical combination for fix; preparation prior to taking bearings; technique with direction finder, plotting of fix; three-arm protractor position plotting; running fix. (a-3, b-2, c-1, d-1, e-0, f-Technique)

1366. STRUSZYNSKI, W., AND TOZCYLOWSKI, H. S., "Loop Feeders Used with Outfit FH3. Parasitic Pick-up Due to Lack of Magnetic Screening," Admiralty Signal Establishment (British) Report No. M.394; November 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1367. TRENTINI, G. VON, "Direction Finding System Providing Altitude Measurement by the Voltage Comparison Method Using Two Receivers," (German D.L.V.) See: Air Document Index No. R4026 F370-417; November 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0).

1368. BURGESS, R. E., "The Iron-Cored Loop Receiving Aerial," Radio Department, National Physical Laboratory (British) Paper RRB/c.42; 15 November 1941. ABSTRACT: First the factors determining the signal/noise ratio in loop reception are analysed and it is shown that the magnification factor (Q) of the loop and the value of $nA/\sqrt{L}$ should be as large as possible, where nA is the product area-turns and L the inductance of the loop. To make $nA/\sqrt{L}$ large, the loop winding should enclose as much of the available space as possible, and the number of turns should be sufficient for L to be approximately proportional to n^2 if the required inductance is small, it may be necessary to use two windings in parallel to secure this condition. The electrical volume ($4\pi n^2A^2/L$) of a loop is suggested as a criterion of the efficiency with which the available space is utilised. The complex effective permeability of a mass core is expressed in terms of the relevant factors, and the imaginary part is shown to be related to the eddy current losses in the particles. The various components of loss due to the core are discussed and the eddy current loss which should predominate is treated in detail. The increase of pick-up due to a spheroidal core is calculated and it is shown that the core should be elongated in a direction parallel to the axis of the loop. The effect of a hollow spheroidal core is discussed and it is found that in a typical case 80% of the iron can be removed before the increase of pick-up is halved; the effect of spacing the winding from the core is treated approximately. An expression is derived for the overall improvement in sensitivity of the loop due to the iron core thus enabling recommendations to be made regarding the design for maximum sensitivity. The German iron-cored loop PR 3 is described and it is shown to be approximately as sensitive as a single-turn air loop of diameter 32 cm. The increase of pick-up due to the core as determined experimentally is found to be in good agreement with the theoretical value. (a-1, b-3, c-1, d-5, e-46, f-Loop antennas; see later abstract citing this paper dated June 1946)

1369. NATIONAL BUREAU OF STANDARDS, "Progress Report on High-Frequency Direction Finder Apparatus Research," Radio Section, National Bureau of Standards; 15 November 1941. ABSTRACT: (I) Introduction; (II) Program established by N.D.R.C. for high-frequency direction-finder apparatus research by National Bureau of Standards; (III) Theoretical analysis; (IV) Experimental work, general; (V) Determination of polarization errors in radio direction finders; (VI) Program for future work. (I) Introduction. This report summarizes the work done to date by the N.B.S. on this project for the N.D.R.C., the results obtained, and recommendations for future work. Following the establishment of the program (Part II hereof) by the N.D.R.C. Communications Section at its meeting, March 27, work was begun on April 1 on plans and analysis. The work was begun by, and continued under the direction of Mr. H. Diamond, with some assistance in analysis and direction by Mr. K. A. Norton of the Federal Communications Commission. Arrangements were made with the Commission also to provide facilities for field and laboratory work at its monitoring station at Laurel, Maryland and to transfer Mr. M. C. Mobley, Jr.,(Associate Engineer) to this work on May 7. Some difficulty was had in recruiting additional trained men for the work but finally Mr. L. M. Poast, formerly with Jansky and Bailey, was secured (Assistant Radio Engineer) on July 1, and Dr. H. Lifschutz, formerly with Naval Research Laboratory, was secured (Assistant Radio Physicist) on September 2. The following parts of this report are self-explanatory. The principal results of the work are: (1) The development of an advantageous experimental procedure for determining the magnitudes of polarization errors, reported in detail in Part V; (2) The tentative conclusions reached in Part III (e), in particular the emphasis on the spaced horizontal loop antenna direction finder; (3) the program for future work, part VI. It is estimated that items 1 and 2 of the program for future work can be completed by next July. Items 3 and 4 could be undertaken thereafter. Items 3 and 4 might be carried on in parallel by different organizations for purposes of speed. (a-3, b-3, c-1, d-1, e-790, f-Spaced loops)

1370. ROSS, W., "Further Development of the H-Type Adcock D/F in the Frequency Band 3 - 30 mcs," National Physical Laboratory (British) Report No. RRB/c.43; ca November 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Progress Report)

1371. HINSDALE, E. M., Jr., "Laboratory and Field Tests of Radio Sets SCR-504-T1 and SCR-504-T2, Portable Direction Finders (Hazeltine Suitcase Direction Finder)," Signal Corps Engineering Laboratory, Eatontown, Report 750 (Coles:D/F Group); 18 November 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test Report)

1372. ANONYMOUS, "Instructions for the Installation of Direction Finder 77 Lg 1-2052 B," (German L.G.H.) See: Air Document Index No. R2145 F610; December 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1373. ANONYMOUS, "Test Results and Discussion of the VHF Adcock 'Burg'," (German) See: Field Information Agency, Technical, Division 677 Report 27; ca December 1941. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Test report)

1374. CRAMPTON, C., STRUSZYNSKI, W., AND WHIPPLE, R.T.P., "High Frequency Direction Finding in H. M. Ships. Secondary Radiation from a Ship's Superstructure and Factors Controlling the Selection of the Most Suitable Position for H/F D/F Aerials in Ships," Admiralty Signal Establishment (British) Report No. M.400; December 1941. ABSTRACT: The provision of accurate and reliable HF D/F in Naval and Merchant ships for a continuous frequency coverage 1 - 20 megacycles is the most difficult technical problem in the whole field of Naval directional wireless. The results obtainable even after elaborate precautions have been taken are, for instance, very much inferior to those which are obtained in H. M. ships on MF (60 - 1000 kilocycles). They are also inferior to the results which can be obtained under some circumstances in the VHF range (30 - 300 Mc/s.) The special difficulties in the 1 - 20 Mc/s band can be explained in the following way. In general accurate and reliable direction finding in ships is only possible when the D/F aerials can be placed in such a position that the secondary fields caused by metallic objects in the vicinity are small compared with the main, incident field. It is also necessary for accurate work over a band of frequencies that any secondary field present should not vary greatly for a small change in frequency. Considering, then, the case of MF D/F in ships, it can be stated as a fact that if simple precautions are taken to place the D/F framecoil in a fairly clear position, comparatively small secondary fields are experienced. Also, if an unfavourable position must be accepted so that the secondary fields are large, yet owing to the fact that they are in most cases of a type which does not change appreciable with frequency, some simple form of electrical or mechanical compensation can be applied. Now consider the HF case. In the range 1 - 20 Mc/s, i.e., 300 - 15 metres, a number of parts of the ship's structure and rigging will successively assume the quarter wave resonant condition as the wavelength is progressively decreased. First the masts, approximately 100 ft above the water-line, will resonate at a frequency of about 2.5 Mc/s. The various W/T aerials may have resonances at about the same frequency. The Bridge superstructure will resonate at about double this frequency, i.e., 5 Mc/s and the funnels, standing about 30 ft above the deck will be in resonance at about 7 Mc/s. There are also numerous other small parts of the ship which are tall enough to cause them to resonate at other frequencies below 20 Mc/s. Some of the structures mentioned will assume a second, third and even higher mode of oscillation within the working frequency band. It is seen that any position in a ship where HF D/F may be installed is under the influence of a complex secondary field caused by re-radiation from a large number of oscillators tuned to different frequencies within the working range. The question arises as to how near to a resonant conductor a direction finder can be placed without imparing its performance. This matter is dealt with in some detail

in Appendix B, but for the present it will be useful to state the conclusion that at a horizontal distance from the base of a quarter wave oscillator equal to three times its height, a direction finder will function with errors on the resonant frequency of the oscillator up to about 20° (or alternatively the minima may be badly blurred). Taking, therefore, the case of a normal ship's mast, it would be necessary to place the D/F aerial system 300 ft away, in order that bearings could be taken on 2.5Mc/s, with deviations not exceeding 20°. Again, the Bridge structure resonating at about 5 mcs will cause similar errors if the direction finder is placed nearer than 150 ft. The corresponding spacing necessary in the case of a funnel is about 90 ft. The shortest vertical structure, which will have a natural frequency in the HF band 1 - 20 Mc/s, is one about 12 ft high and the necessary distance of the D/F aerials from it would be 36 ft. It is observed that in order for the D/F to work with the minimum acceptable performance, i.e., with errors not exceeding 20° on any frequency in the 1 - 20Mc/s band, the spacing requirements just stated must all be simultaneously satisfied. It is obviously a very difficult matter to obtain any position near the deck of any ordinary ship or vessel where this is possible. The improvement which may be obtained in the site for the HF D/F aerials by raising them above the deck is a most important matter, which is dealt with in Appendix B, and it may be briefly stated here that raising the aerials by a few feet clear of the deck is of little value, but a position at the top of the tallest mast in the ship is the most favourable site that can be found. This latter site, however, is generally occupied by R.D.F., and only in special cases can it be made available for HF D/F. It is to be noted that for a slight departure from the resonance frequency of each of the structures there will be a large change in the reradiation and therefore, in the deviation it produces. Therefore, the possibility of making allowance for the deviation caused by these structures requires a very exact knowledge of the frequency in use, and also of the manner in which the curve of deviation varies for small changes in frequency. This introduces both the need for greater care in calibrating and using the apparatus, and also the possibility of error. In this respect, the situation is different from the MF D/F case, in which the D/F aerial can be satisfactorily sited within a few feet of a bulkhead causing errors of the same order as in the HF case quoted above but which change very slowly with frequency. It is worth while noticing finally, that on passing to the VHF band, i.e., 30 - 300 Mc/s, there is again the possibility of obtaining more favourable sites for wireless directional aerials, particularly as the wavelength becomes shorter and shorter. There are, of course, numerous small structures in the ship capable of reradiation on these frequencies, but in the case of such short wavelengths there is a very much better chance of satisfying the spacing requirement stated above, owing to the shorter distances involved. (a-1, b-3, c-1, d-5, e-64, f-Description and analysis)

1375. NORTON, K. A., "The Calculation of Ground-Wave Field Intensity over a Finitely Conducting Spherical Earth," Proc. IRE, vol. 12, p. 623; December 1941. ABSTRACT: Equations and curves are presented which simplify the calculation of ground-wave field intensity over a finitely conducting earth for transmitting and receiving antennas of arbitrary heights and polarization. (a-1, b-1, c-1, d-1, e-279, f-Basic theory)

1376. ANONYMOUS, "Report on Inspection and Calibration of W.D. D.F. Station at Helston," National Physical Laboratory (British) Report No. WO/NPL.3; 8 December 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Calibration report)

1377. ANONYMOUS, "Report on the Selection of a Site for a Short-Wave Direction Finding Station at Thurse," National Physical Laboratory (British) Report No WO/NPL.2; 8 December 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Site selection)

1378. ANONYMOUS, "Report on W.D. Short Wave Direction Finding Station at Montrose," National Physical Laboratory (British) Report No. WO/NPL.1; 8 December 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1379. ANONYMOUS, "Preliminary Measurements of Polarization Errors of a Navy Model DY Direction Finder," Radio Section, National Bureau of Standards, Report LMP:ANK I-6 R125.31L; 9 December 1941. ABSTRACT: This report presents the results of measurements of polarization error on a Navy Model DY radio direction finder located at the Federal Communications Commission's monitoring station at Laurel, Maryland. The measurements are of a preliminary nature and represent an application of the simple procedure described in the Progress Report of November 15, 1941, for determining errors in direction finders caused by the state of polarization of the received radio waves. They were made to determine whether the magnitude of these errors are as large as was suspected from similar measurements on an experimental H-type direction finder. A further object was to provide data for study of means for reducing the polarization errors in the DY. The site on which the direction finder is located is free from trees, overhead wires, and buried conductors within a radius of approximately 300 feet. The terrain is flat over the area immediately covered by the rotatable antenna system and is of a gently rolling nature over the adjacent area. The antenna system consists of two spaced vertical dipoles. Transmission lines extending to each dipole are connected differentially to a short vertical transmission line which in turn is connected to the input terminals of the radio receiver. The receiver power supply consists of storage batteries and a vibrapack. A hollow metal tube is used as a cross arm to support the dipoles and to contain the transmission lines. The receiver and its power supply are enclosed in a metal box which is immediately below and in contact with the cross arm. The entire receiving apparatus with the exception of the vertical dipoles is therefore enclosed by metal housing. (a-3, b-3, c-1, d-1, e-786, f-Errors)

1380. NATIONAL BUREAU OF STANDARDS, "Correlations for Polarization Errors of Bearings with the DY Direction Finder," National Bureau of Standards, Radio Section, Ltr. RL:ANK I-6 R125.31K; 11 December 1941. ABSTRACT: The deviation of a measured bearing from the true bearing cannot be assigned wholly to the effect of lateral deviation from the great circle path unless an instrument free from polarization error is used. The DY direction finder is not free from polarization error. Formulas for the polarization error of a DY direction finder are given. (a-1, b-3, c-1, d-1, e-787, f-Errors)

1381. ANONYMOUS, "Report on W.D. Short Wave Direction Finding Station at Perton (near Wolverhampton)," National Physical Laboratory (British) Report WO/NPL-4; 26 December 1941. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1382. ANONYMOUS, "Specifications for the Choice of the Site for a Short Wave and Medium Wave Direction Finder Station," International Telephone and Radio Laboratory Memo Report No. 15; 26 December 1941. ABSTRACT: A list of distances to objects on a direction finding site which should be maintained to keep error to a negligible value. (a-4, b-3, c-1, d-1, e-0, f-Specifications, D/F site)

1942

1383. ANONYMOUS, "Air and Ground Equipment for Civil Aviation, (PV 1)," Standard Telephone and Cables, Ltd. (British) Pre-publication Bulletin 501; ca 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description of equipment)

1384. ANONYMOUS, "Direction Finder Developments, Bearing Indicator for Ground Stations," Wireless World, vol. 48, p. 97; 1942. ABSTRACT: A short description is given of a Bell Laboratories D/F which uses five dipoles, four being for direction determination and the other for providing information to determine the sense of the bearing. The bearing indication appears as a straight line on a cathode ray tube screen. A more complete description of the equipment is given in the Bell Laboratories Record; November 1941. (a-6, b-1, c-1, d-5, e-0, f-Description)

1385. ANONYMOUS, "H.F. Automatic Direction Finder Type P.V.2," Standard Telephone and Cables, Ltd. (British) Pre-publication Bulletin 502, Issue 3; ca 1942. ABSTRACT. Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1386. ANONYMOUS, "Installation Instructions for Model DAH, DAH-2, Intermediate Frequency Radio Direction Finder Equipment," Federal Telephone and Radio Corporation, Newark, N. J. See Department of Commerce PB17872; 1942. ABSTRACT: Installation instructions are given for the DAH, DAH-2 intermediate frequency direction finder equipments. The frequency range of these units are 250 KC to 1500 KC. Supplementing text are photographs, drawings, metric conversion charts and schematics. (a-3, b-3, c-1, d-1, e-535, f-Instructions)

1387. ANONYMOUS, "Instruction Book for Model DAK-3 Intermediate Frequency Radio Direction Finder Equipment," Federal Telephone and Radio Corporation, Newark, New Jersey, NAVShips 900, 264-IB; See Department of Commerce PB17884; ca 1942. ABSTRACT: The model DAK-3 is an intermediate frequency radio direction finder equipment using a fixed crossed loop and a sense antenna for use on board ship. It covers the frequency range between 250 and 1500 kilocycles.

Two methods of bearing determinations are provided: (1) A manually operated goniometer and a two-inch cathode-ray tube in the receiver provide bearing indications by the matched-line method; (2) a second position on the indication switch provides bearings by null methods, both aural and visual. This instruction book covers installation, operation and maintenance, and contains parts lists, tables, photographs and schematic diagrams. The book is not dated, but diagrams and errata sheet are dated 1944. (a-3, b-3, c-1, d-1, e-0, f-Instruction manual)

1388. ANONYMOUS, "Instruction Book for Navy Model DAB-3 Radio Direction Finder Equipment," Collins Radio Company, Cedar Rapids, Iowa; See Department of Commerce PB17873; 1942. ABSTRACT: This equipment is designed to indicate the direction of arrival of the normally polarized component of radio waves at any frequency within the range of the equipment (2000 to 18,100 kc). It has a rejection ratio of 100to 1 at a frequency 10 kc off resonance. Instruction book contains sections on circuit function, installation, adjustments, operations and maintenance, supplementary data, parts list. Photographs, drawings, schematic and wiring diagrams are included. (a-3, b-3, c-1, d-1, e-537, f-Instructions)

1389. ANONYMOUS, "Instruction Book Scanning and Direction Finding Receiver for Land Stations - Type CXGJ-1," Federal Telecommunications Laboratories, Nutley, New Jersey;ca 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1390. ANONYMOUS, "Instruction Book for Scanning and Direction Finding Radio Receiver for Aircraft Service - Model CXGJ-2," Federal Telecommunications Laboratories, Nutley, New Jersey; ca 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1391. ANONYMOUS, "Operating Instructions for the Stratosearch Radio Direction Finder ST-RDF-AC-3," 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

1392. ANONYMOUS, "Preliminary Instruction Book for Model DAQ High Frequency Radio Direction Finding Equipment Frequency Range 1.5 to 22 mc," Federal Telecommunications Laboratories, Nutley, New Jersey; 1942. ABSTRACT: The model DAQ high frequency direction finder employs a crossed loops and sense antenna design for mast top mounting on a Naval surface ship similar to the FH-3 British developed equipment. The original DAQ equipment used RG-24 RF transmission lines to couple the antenna to a receiving and indicating equipment providing instantaneous visual bearing indications on a 5-in. cathode ray tube by means of a motor driven goniometer operating at 1140 rpm. The equipment is designed to operate for bearing reception between 1.5 and 22 mc and for reception without bearings between 1.5 and 30 mc. The 22 to 30 mc range contains a goniometer resonance which introduces large errors near 25 mc, however, successful bearings can be obtained throughout this range with modification to the goniometer. The superheterodyne receiver uses a 445 kc IF and provides the overall system with a bearing sensitivity of 30 microvolts per meter for 20 db signal-to-noise ratio. The crossed loops assembly weighs 95 pounds, is 52 inches wide and 140 inches high including the sense antenna. If the sense antenna and its counterpoise rods are removed, the height of the crossed loops would be approximately 72 inches. The maximum width of any loop of the crossed loop pair is 74 inches. The sense antenna which was intalled concentrically at the top of the crossed loops was was used in the conventional manner through a 90-degree phase shifter to obtain a cardioid pattern which by convention resolved the ambiguity. The indicator system used magnetic deflection and rotation of the sense pattern was performed by switching the deflection amplifier outputs 90 degrees in space in the magnetic deflection system. The 90-degree phase shift for the sense system was obtained by using a reactively loaded amplifier in the form of a resonant circuit below the lowest frequency at which sense is to be obtained. The goniometer was a solenoid wound sine-cosine device with a rotary output transformer. The receiving system uses no AGC. (a-4, b-3, c-1, d-1, e-545, f-Instructions)

1393. ANONYMOUS, "Yearbook 1941/1942," (German: D.A.L.) See: Department of Commerce PB25250; 1942. ABSTRACT: This yearbook contains introductory material by various German scientists and industrialists connected with German aviation. It also presents the biographies of well known honory members and members of the German Academy of Aeronautic Research. Furthermore, it contains a bibliography of literature connected with aeronautics which was published by its members through the previous years. The scientific part of this yearbook presents lectures of various members of the academy during the scientific sessions in the session period of 1941/1942. The following problems were discussed: On the propagation of ultra short waves and the possibilities of practical use. Ionospheric research by J. Zenneck. (a-3, b-3, c-4, d-4, e-0, f-Yearbook)

1394. ALPERT, J. L., MIGULIN, V. V., AND RYASIN, P. A., "An Investigation of Electromagnetic Fields, and Phase Structure of an Electromagnetic Field," Journ. Tech. Physics, U.S.S.R., vol. 11, p. 7; 1942. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Theory)

1395. BUILDER, G., AND DOWNES, J. G., "Ultra-High-Frequency Radio-Range and Marker Receivers for Aircraft," Amal. Wireless Aust., vol. 6, no. 1, pp. 1-15; July 1942. ABSTRACT: A description is given of a receiver and associated equipment for use in aircraft to give visual and aural reception of radio-range and marker-beacon signals. (a-3, b-1, c-1, d-11, e-0, f-Description)

1396. EARP, C. W., AND GODFREY, R. M., "Radio Direction Finding by the Cyclical Differential Measurement of Phase," Standard Telephone and Cables, Ltd. (British); ca 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Detailed paper published later, see Abstract No. 2769, March 1947)

1397. FISCHER, G., "Direction Finding with Antenna Periodically Disconnected for Short Periods," Hochf: tech. u. Elek: akus, vol. 59, p. 63; 1942. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1398. GILL, E.W.B., "German Academic Scientists and the War," OCSigO; ca 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1399. GREEN, A. L., "Theory of Reversed Homing," Amal. Wireless Aust. Techn. Rev., vol. 6, no. 1, pp. 43-58; July 1942. ABSTRACT: The theory of reversed homing indicates that errors in flight may be restricted, provided that suitable conditions are observed. These conditions involve the avoidance of head winds, and the use of a sufficiently long base line; i.e., distance between radio transmitter and start of flight. (a-3, b-1, c-1, d-11, e-0, f-Analysis)

1400. GRUNBERG, G. A., "Theory of the Coastal Refraction of Electromagnetic Waves," J. Phys., USSR, vol. 6, no. 5, pp. 185-209; 1942. ABSTRACT: The boundary conditions for propagation over a discontinuity of ground are derived, and are used to formulate an integral equation for the vertical electrical field, which is the basis of the problem. The special case of an infinite straight coastline is analysed in detail and an approximate solution is obtained for the field at ground level. It is shown that, after a deviation at the coast, the direction of propagation returns asymptotically towards that of the primary wave. Some general arguments concerning the approximate solution in the case of irregular small islands are given, and new formulae for solving the integrals involved, using Bessel's functions, are derived. No numerical or practical results are given. (a-3, b-1, c-2, d-2, e-0, f-Theoretical analysis)

1401. KINDER, H., "Direction Finding by Means of Radio Sounding with Mirror-Collected 25cm Waves," (German) See: Department of Commerce PB23989; 1942; ABSTRACT: This is a report of the "Flugfunk-Forschungsinstitut Oberpfaffenhofen." This study describes a method for 3 dimensional locating of radiosondes. The exactness of the direction finding is calculated for any combination of positions through the average angular error. The results obtained with this method are presented and discussed in this study. Photographs are included. (a-3, b-3, c-4, d-4, e-0, f-Study)

1402. KUMMICH, R., ROSENSTEIN, H.O., AND JOHNSKE, F., "Telefunken Patents for Direction Finding with Rotating or Reciprocating Directional Receiving Systems," Hochf: tech. u. Elek: akus, vol. 59, p. 63; 1942. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Index of German patents)

1403. LEIB, A., "Direction Finding by Minimum Readings, through Interference Having the Same Note Frequency as the Desired Signal," Hochf: tech. u. Elek: akus., vol. 59, p. 124; 1942. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1404. LITTLE, D. S., "Medium-High-Frequency Visual Ground Direction Finding," Aero Digest, vol. 40, p. 70; 1942. ABSTRACT: Illustrated description of Western Electric Co. direction finder apparatus suitable for use in taking bearings on domestic air carrier aircraft; azimuth indicating radio system, operates in 2 to 7-mc band; equipment gives visual indication of direction of source of any radio waves to which receiver unit is tuned; ordinary telephone circuit connects collector system with indicating and control equipment. (a-3, b-2, c-1, d-1, e-0, f-Description)

1405. MC GILLIVRAY, J. A., "Automatic Aircraft Navigational Dual Direction Finders," Wireless World, vol. 48, p. 38; 1942. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

1406. RUNGE, W., AND GOTHE, A., "Arrangement for Distinguishing between the 4 Null-Points of an Ambiguous Direction-Finder System Free from Night Effect," Hochf: tech. u. Elek: akus., vol. 59, p. 186; 1942. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Description)

1407. SANDRETTO, P., AND BUCKTHAL, E. P., "Direction Finding at Medium-High Frequencies. United Air Lines Ground Station Direction Finder," Proc. IRE, vol. 29, p. 604; 1942. ABSTRACT: Mr. Sandretto introduced the subject with a description of the early long-wave direction finders used on commercial aircraft. Fading and the deviation of waves were then discussed. The use and behavior of polarized waves were treated. A description was given of modern aircraft direction-finding equipment. For comparison purposes, pictures of earlier equipment were shown. These included the Adcock antenna and the goniometer. Conventional spaced loops were then described. The equipment used by the United Air Lines was then described. A double-loop antenna is employed. The operation of the system was considered and it was pointed out that no excessive horizontal errors have been found with it. Although the null indication may be obtained aurally, greater accuracy results from recording with an inked stylus. This recording permits ready detection of fading conditions. Mr. Buckthal then described the equipment in detail. The coaxial, coplanar loop and its advantages over the Adcock loop were discussed. By employing a vertical antenna and the loop, a cardioid pattern having a sharp null is obtained. Superheterodyne receivers using crystal filters at the intermediate frequency o obtain high selectivity are used. Additional selectivity is obtained by the use of filters in the audio-frequency section of the received. The detector is designed for operating a recorder. The 360 degrees are spread over approximately eleven inches of arc on the record sheet. A special rule marked in degrees differentiates effectively between null and maximum values. At frequencies below 500 kilocycles, the accuracy of aircraft direction finding varies inversely with the distance. It departs considerably from this inverse law at higher frequencies. With the double-loop system, no error exceeding 7.5 percent has been found. (a-5, b-1, c-1, d-1, e-0, f-Description)

1408. SANDRETTO, P. C., Principles of Aeronautical Radio Engineering, McGraw-Hill Book Co., Inc., New York, N. Y., pp. 140-142; 1942. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Textbook)

1409. WEBB, W. L., AND ESSEX, G. O., "The Automatic Radio Compass," Aeronautical Eng. Rev., vol. 1, no. 8, pp. 23-27, 29, 31-32, 37-38; November 1942. ABSTRACT: Types of radio bearing equipment; operation of automatic compass; compass components; induced loop voltages; coupling circuit; compass output voltage; thyratron tube control; inertia compensation; azimuth indicating system; compensator; ground calibration; aerial navigation; cross-wind effects; radio bearings; dual radio compass; recent developments. Before Inst. Aeronautical Sciences. (a-3, b-2, c-1, d-1, e-0, f-Description)

1410. WOLF, A., "The Impedance of a Ground Wire," Geuphysics, vol. 7, pp. 414-418, 1942. ABSTRACT: The impedance of an insulated wire stretched along the surface of the earth is regarded as a homogeneous conductor. It is a function of frequency and of the conductivity of the earth. Formulas are given for the inductance and the resistance of such a wire which are appreciable under conditions met within geophysical prospecting. (a-1, b-1, c-1, d-1, e-0, f-Theory)

1411. ANONYMOUS, "Construction and Operating Manual for the Mobile Radio Direction Finding Installation Fu Peil A 70 f.," (German: Telefunken) See: Air Document Index No. R2098 F142. January 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-instructions)

1412. ANONYMOUS, "Instruction Manual for Model DAG Portable Radio Direction Finder Equipment," Airplane and Marine Instruments, Inc., Clearfield, Penn. See Department of Commerce PB17875; January 1942. ABSTRACT: This book contains operating and maintenance instructions for the model DAG portable radio direction finder equipment. This is a high frequency portable direction finder operating in the frequency range from 1.6 to 18.2 mc, suitable for locating radio transmitters of unknown location. It may also be used to determine the location of receivers with respect to transmitters of known location by triangulation and as a communications receiver for both CW and amplitude modulated signals. Tables, photographs and diagrams are included. For instruction book on later models of this equipment, see PB17873. (a-3, b-3, c-1, d-1, e-520, 536, f-Instructions)

1413. ANONYMOUS, "Manual for the APZ5 Automatic Direction Finder," (German) See: Air Document Index No. R233 F381; January 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instruction manual)

1414. ANONYMOUS, "Preliminary Specification, D/F Outfit FH3," Admiralty Signal Establishment (British) Report B132/42; January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1415. GOLDSTEIN, M. K., "Specifications for Fixed Collector Type Radio Direction Finding Equipment, Frequency Range 250-1500 KC, for Use with Adcock or Loop Antennae: RA-13A 250 B. B. Edition," U.S. Navy. See Department of Commerce PB27448; January 1942. ABSTRACT: The radio direction finding equipment covered by these specifications is intended for use aboard all types of vessels of the U. S. Navy or at Naval radio shore stations. Throughout its entire frequency range, this equipment shall be capable of taking rapid, radio bearings on pure, modulated (pure or complex) interrupted or keyed CW or complex modulated CW radio frequency signals, and simultaneously delivering through the speaker or a telephone head set, audio frequency signals, keyed or modulated in accordance with the impressed signals. This D/F equipment shall be capable of taking bearings in the continuous frequency range of 250 to 1500 kc and shall be capable of operating from a rated power source of either 110-, 115-, or 120-volt, 55- to 65-cycle, single phase, alternating current. The maximum power consumed shall be as small as possible and shall not exceed 200 watts when operating on a 115-volt, 60-cycle power source. Principal and applicable sub specifications and general and construction requirements are given. Specifications for dimensions and weights are included. The component unit requirements, including the modulator-receiver unit and power-indicator unit are given in detail, as well as the electrical specifications and tests. Tables and a section on definitions are included. (a-3, b-3, c-1, d-1, e-0, f-Specifications)

1416. LA PORT, E. A., AND KNOX, J. B., "Radiating System for 75 Mc./s." Proc. IRE, vol. 30, pp. 26-29; January 1942. ABSTRACT: An improved aerial system is described, for use on civil airways stations across Canada for the 75 megacycle cone-of-silence marker. The field of the new system was deduced from flight measurements of signal potentials induced in the aircraft's receiving aerial on figure '8' courses across the marker at altitudes from 1000 to 10,000 feet. The results show that the new system provides a sharper marker beam than previous systems and reduces the orientation error. (a-3, b-1, c-1, d-1, e-0, f-Description)

1417. TRENTINI, G. VON, "Radiators for Vertically Polarized Emanations Suitable for Direction Finding at Small Angles of Elevation," (German: D.L.V.) See: Air Document Index No. R4026 F446-7; January 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1418. ANONYMOUS, "A Portable Direction Finding Receiver," General Post Office (British) Report No. 813; 1 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1419. TOTH, E., "Preliminary Instructions for Installation and Operation of Type 50085 Low-Frequency Loop Coupling Unit," USN, NRL, Letter Report No. RA 50A 249C; 1 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1420. ANONYMOUS, "The Performance of Long Range Cathode Ray H/F D/F Stations," Operations Research Section, Headquarters, Coastal Command, Report No. 163; 5 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1421. TOTH, E., "Instructions for Modification of Type CN 50085 Low-Frequency Loop Coupling Units for Alternative Use with DQ or Clearing-Line Loops," USN; NRL, Letter Report No. RA 50A 252A; 6 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1422. ROSS, W., "The Effect of Sloping Ground on the Accuracy of Radio Direction Finding," National Physical Laboratory, (British) Report No. RRB/C.55; 7 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Study)

1423. NORLUND, R. J., ASTHOL, P. T., AND WEIHE, V. I., "Investigation of the Night Effect Errors of an Automatic Radio Compass," AAF, Wright Field, Dayton, Ohio, Aircraft Radio Laboratory, Engineering Report No. 322 See Department of Commerce PB6239; 8 January 1942. ABSTRACT: In discussions with the Chief of the Air Navigation Unit and the Director, ARL, more complete data on the "night effect" characteristics of the automatic radio compass were requested. The purpose of the study was to investigate the "night effect" characteristics of the now standard automatic radio compass in order to provide additonal information to the service. Incidental but valuable life test data on this newly standardized equipment were also anticipated. Answers to the following questions were sought: (1) what is the nature and magnitude of "night effect" errors on Radio Compass SCR-269-(C) and similar low frequency equipments using both loop and vertical antenna? (2) at what periods do these errors occur? (3) what is the relation between the magnitude of the errors, and the distance from the transmitter in each frequency range? (4) what type of reference antenna gives the greatest freedom from "night effect" error? (5) how can the operator recognize the presence of "night effect", and can a brief set of rules be formulated to enable him to make better use of the equipment? The test set-up consisted of a Radio Compass SCR-269-C installed on the top of a 50-foot wooden tower at Patterson Field, Ohio, in a region isolated from possible sources of interference. Twenty-four hour tests starting October 24, 1941, were made on broadcast, and radio range stations at varying distances at frequencies within the 200 to 1750 kilocycles frequency range of the equipment. Three types of reference antenna were used during the tests: (1) vertical red, (2) horizontal red, (3) a slightly unbalanced dipole. The Radio Compass SCR-269-(C) was equippped with the necessary circuits for automatically recording the bearing position, audio output, tuning meter deflection, and line voltage. One circuit was used to record the bearing position taken by the radio compass and the actual "night effect" errors. The additonal three recorders were used to insure control of factors entering into the unattended installation. The circuits used for the four automatic "strip chart" type recorders are shown on pages 3 and 4. The power supply for the Radio Compass SCR-269-(C) consisted of a standard 400 cps inverter driven by storage batteries. (a-1, b-3, c-1, d-1, e-845, f-Report)

1424. ANONYMOUS, "Report on the Inspection and Calibration of W. D. Direction Finding Station at Sutton Valence," National Physical Laboratory (British) Report No. WO/NPL. 5; 9 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1425. ANONYMOUS, "Preliminary Tests on Automatic Electric Company Direction Finder, 600 - 2800 Kc," Signal Corps, Engineering Laboratories, Monmouth (Coles: D/F Group); 12 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1426. ANONYMOUS, "Final Report Embodying the Results of Investigations of a Group of Short Wave W. D. Direction-Finding Stations," National Physical Laboratory (British) Report No. WO/NPL. 6; 20 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1427. LUCK, D.G.C., "Wave Collectors for Semi-Portable Radio Direction Finders for High Frequencies," Radio Corporation of America, Camden, New Jersey; Project No. C-17, OSRD Report No. 337. See also Department of Commerce PB L87762; 21 January 1942. ABSTRACT: General review of the properties of radio waves and of known direction finding wave-collectors indicates that simple loop- or dipole-antenna direction finders are not usefully accurate under normal conditions of high-frequency wave propagation. Wave-collectors consisting of spaced antennas are in principle highly accurate. As very rapid bearing indication is sometimes needed, systems operating without large-scale mechanical motion are preferable. Practical accuracy of spaced-antenna fixed systems is limited by difficulty in keeping all antennas identical and by unwanted pick-up on extraneous conductors, such as lead-ins, essential to the antenna system. The first difficulty must be overcome by careful design, construction and installation. The second can be attacked by balancing unwanted pick-up out of the output from the complete system, through use of highly symmetrical antennas, or it can be attacked by shielding the unwanted conductors from the incoming waves and from the antennas themselves. The first expedient gives rise to H-Adcock, balanced U Adcock and spaced-loop direction finders, all of which have already been given considerable study. The second expedient is that of the shielded-U Adcock, which has never been fully studied as to the nature and extent of shield required to produce sufficiently accurate bearings on sky waves. To make such a study, with respect to semi-portable equipment only, is the purpose of the present project. Performed by RCA Research Laboratories, Camden, New Jersey. (a-3, b-3, c-1, d-1, e-0, f-Review)

1428. BUSIGNIES, H., "Short Wave Direction Finding Errors," Federal Telecommunications Laboratories, Nutley, New Jersey; 31 January 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1429. ANONYMOUS, "Amplifiers, Type M 1050 and M 1052 for E - Compass Installations," (German: Kriegsmarine Werft, Kiel) See: Department of Commerce PB L88950; February 1942. ABSTRACT: Three pages containing two wiring diagrams. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1430. ANONYMOUS, "Instruction Book for Navy Model DAB and DAB-1 Radio Direction Finder Equipment," Collins Radio Company, Cedar Rapids, Iowa. See Department of Commerce PB17486; February 1942. ABSTRACT: This instruction book and its supplements cover the installation, adjustment, operation, and maintenance of the Navy Model DAB radio direction finding equipment suitable for use at fixed land stations to indicate the direction of arrival of the normally polarized component of radio waves of any frequency within the range 2000 kc to 18,000 kc. Diagrams, drawings, tables, and photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1431. LIEBMANN, "Experiments with Automatic Direction Finder APZ 1 Made by the Firm Frieseke and Hopfner," (German D.L.H.) See: Air Document Index No. R2667 F812; February 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Report)

1432. BOSE, P., "Study of Errors of Indication in Adcock Shortwave Direction Finder," (German F.F.I.) See: Air Document Index R2667 F812; February 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Error study)

1433. BREUNINGER, H. W., "The Limits of Usefulness of the Adcock Direction Finder with 'N' Masts," Hochf: tech u. Elek: akus, vol. 59, pp. 50-57; February 1942. See also Wireless Engineer, vol. 19, p. 480; October 1942. ABSTRACT NO. 1: It is shown that an Adcock-aerial system consisting of n aerials possesses a limiting frequency above which no D/F working is possible, which is independent of n, and which is governed only by the diameter of the whole system. How far below the limiting frequency bearings can be taken depends on n. The theoretical error and the theoretical blurring of minimum are expressed in approximate formulae and are discussed. ABSTRACT NO. 2: An Adcock direction finder consisting of n aerials connected to n coils of a radiogoniometer possesses an upper lim. frequency dependent only on the dia. of the complete system. How far below the lim. frequency direction finding is possible depends on n. A theoretical investigation gives an approx. determination of errors and dulling effects, the latter being the lim. factor for odd-numbered, and the former for even-numbered Adcocks. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Theoretical analysis)

1434. ANONYMOUS, "An Automatic VHF Direction Finder," Standard Telephone and Cables, Ltd., (British) Report No. 3760/RFC; 3 February 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1435. HORNER, F., "Radio Direction Finding Errors with Horizontally and Vertically Polarized Waves at a Wavelength of 2.2 Metres," National Physical Laboratory (British) Report No. RRB/C.44; 9 February 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Errors)

1436. FRANZ, K., "Comparison of Direction Finding Accuracy between the Intersection and the Minimum D/F Methods," (German: Telefunken); 10 February 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1437. PRESSEY, B. G., "A Design of Short Wave Radiogoniometer," National Physical Laboratory-Radio Department; 12 February 1942. ABSTRACT: The paper describes a design of tight coupled screened goniometer suitable for operation on the short wave band (15-100 metres). After consideration of the principles of design, a detailed description and scale drawings of the instrument are given. Four models are described each having windings suitable for operation over a section of the wavelength band. The performance of the goniometers was determined by measurement of the instrumental errors at the quadrantal and octantal points at wavelengths i in the working band of each model. These measurements were made without reference to any external apparatus by interconnection of these coils. In all models the quadrantal error is not greater than 1/4-degree, while the octantal error has values between 1/8-degree and 1-degree. The coupling factor is approximately 0.5 for all models. (a-4, b-3, c-1, d-5, e-208, f-Description)

1438. ANONYMOUS, "Frequency Scanning and Direction Finder Receiver," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 117; 17 February 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1439. MOORE, C. B., "Test of Radio Set SCR-551-T1 (Frequency Range 2 to 8 Mc," Signal Corps, Engineering Laboratory, Eatontown, Report No. 761 (Coles: D/F Group); 18 February 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1440. ANONYMOUS, "Jefferson-Travis Tri-Add Radio Direction Finder-Receiver," Jefferson-Travis, Incorporated, N.Y.C.; 20 February 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1441. ANONYMOUS, "Direction Finding Equipment Peil G VI," (German: Telefunken); March 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1442. ANONYMOUS, "Preliminary Instruction Book - Radio Direction Finding Equipment DAJ," Federal Telecommunications Laboratories, Nutley, New Jersey, Contract date; March 1942. ABSTRACT: The DAJ is a high frequency land based Adcock direction finder providing instantaneous bearings derived from a goniometer throughout the range of 1.5 to 30 mcs. The equipment is composed of four independent antenna arrays designated DAL, DAM, DAN, and DAO. These four-element Adcocks with a central sense antenna are all of the sealed U type. (a-4, b-3, c-1, d-1, e-548, f-Instructions)

1443. ANONYMOUS, "Preliminary Instruction Book for Model DAK-1 Radio Direction Finding Equipment, Frequency Range 250-1500 KC," Federal Telecommunications Laboratories, Nutley, New Jersey. See Department of Commerce PB17479; March 1942. ABSTRACT: The Model DAK-1 Intermediate-Frequency Radio Direction Finder Equipment is a new type of direction finder, using a fixed crossed loop for use on board ship. The equipment is designed and mounted to withstand the effects of vibration, gun-fire, shock, pitch and roll ordinarily encountered in naval service. It is finished in oven-baked grey scratchproof wrinkle enamel. Three methods of bearing determinations are provided: (1) instantaneous visual bearing indications are possible with a minimum of operational time and attention through the use of a cathode-ray tube and a motor-driven goniometer. The indications are continuous and automatic with simultaneous monitoring of the receiver signal for CW, modulated and keyed CW signals. Indications are given on the face of a 5-inch cathode-ray tube to which is fitted an edge-lighted 300° azimuth scale circumscribing the screen. By this method bearings may be obtained as quickly as the various stations can be tuned in; (2) a manually operated goniometer and a two-inch cathode-ray tube on the receiver provide bearing determination by the matched-line method; (3) aural or visual null bearings can be taken with the same goniometer. (a-1, b-3, c-1, d-1, e-549, f-Instructions)

1444. ANONYMOUS, "Radio Direction-Finder Installation," (German: R.L.M.) See: Department of Commerce PB56906; March 1942. ABSTRACT: This is a manual giving calibration test for direction-finding installations. (a-3, b-3, c-4, d-4, e-0, f-Calibration)

1445. ANONYMOUS, "Polarization Error Test of CXAL Direction Finder," National Bureau of Standards and Collins Radio Co., Cedar Rapids, Iowa, 10 March 1942. ABSTRACT: Since a satisfactory local oscillator test for polarization error in Adcock direction finders had been developed at the Bureau of Standards in connection with the N.D.R.C. program, it was desirable that a similar test be devised for the CXAL equipment. With the cooperation of the Navy Department and the Bureau of Standards, Mr. K. A. Norton, of the Federal Communications Commission, came to Cedar Rapids, February 23, 1942, to consult on the development of this test at the Collins Radio Company plant. This report summarizes the preliminary tests made, the test procedure developed by Mr. Norton and members of the Collins Radio Company engineering staff, and the results. The CXAL equipment is of the spaced vertical loop type in which an on-bearing indication is obtained by phase comparison of two receiver out-put voltages. Although the receiver inputs are alternately connected and cross-connected to the two collector loops, each receiver is connected to only one loop at a time. Each loop is tuned by its own tuning condenser and coupled to a 75 ohm transmission line by an electrostatically shielded transformer. The transmission lines are connected to the receivers through a mechanical commutator which performs the switching operation. The equipment is housed on the second floor of a building, with the center of the collector loops 14.3 feet above ground. The spacing between collectors is 16 feet. Power transformer and heater circuitr are installed on the first floor. An electrostatic shield of grounded radial wires is located between the first and second floors to reduce the disturbing electric field of these circuits, although some disturbing magnetic fields may still exist. (a-1, b-3, c-1, d-1, e-788, f-Test evaluations)

1446. ANONYMOUS, "Polarization Errors of the SCR-551 Direction Finder," Radio Section, National Bureau of Standards, Letter:HL:ANK I-6 R125.31M; 12 March 1942. ABSTRACT: The polarization errors of the SCR-551 direction finder were measured by means of the method given in the National Bureau of Standards November 15, 1941 "Progress Report". The applicability of the method to this direction finder is critically discussed. It is shown that the polarization errors are practically identical for the two modes of operation of the SCR-551, namely its operation as an aural null and as a switched-cardioid instrument. This similarity arises because the D/F bearing is taken, in the switched-cardioid method, by rotating the antenna system until the differential output voltage of the H-antenna is zero (or approximately as in the general case). The polarization errors are given for both methods of operation as a function of downcoming angle and average ground constants for 2.5, 5.0, and 7.5 Mc. The errors increase very rapidly with angle of elevation. The standard wave errors are 12.3°, 14.2°, and 19.7° at 2.5, 5.0, and 7.5 Mc over average ground, respectively. For these same frequencies the vertical to horizontal pick-up ratios are 2.45, 4.73, and 5.14 while the corresponding values of ϵ_0, the polarization error for horizontal wave incidence, are 22.2°, 11.9°, and 11.0°. The values of the pickup ratios and of ϵ_0 are measures of the D/F performance which are independent of the ground constants, while the standard wave error is not. This report covers the results of work done by the National Bureau of Standards on the U. S. Signal Corps direction finder, type SCR-551-T1, located at Fort Monmouth, N. J. Both a theoretical and experimental analysis of the polarization errors of this direction finder were made. Both the aural null (or visual null) and switched-cardioid modes of operation of the direction finder are treated. Reference is here made to the November 15, 1941 "Progress Report on High-Frequency Direction Finder Apparatus Research" of the National Bureau of Standards for a discussion of the method used in determining direction finder polarization errors. (a-1, b-3, c-1, d-1, e-24, f-Analysis)

1447. ANONYMOUS, "Radio Direction Finder FuPeil A40e, Fixed. Description and Operating Instructions," (German:Telefunken) See: Air Document Index No. R2310 F539; April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1448. ANONYMOUS, "Radio Direction Finder (Mobile A1)" (German: Telefunken); April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1449. ANONYMOUS, "Radio Direction Finding," (German:R.L.M.); April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1450. ANONYMOUS, "Radio Direction Finding Equipment (Portable) Fu-Peil-A 1/tragh," (German:R.O.L.) See: Department of Commerce PB167744; April 1942. ABSTRACT: This equipment serves primarily for locating modulated and unmodulated transmitters in frequency range between 75 and 3333 kc. It is easy to dismantle and reassemble. The document contains a detailed description, operating and servicing instructions, and parts lists. Photographs, drawing, and graphs included. (a-3, b-3, c-4, d-4, e-0, f-Description)

1451. ANONYMOUS, "Radio Direction Finding Equipment (Stationary) Fu-Peil-A 1/ortsf," (German:R.O.L.) See: Department of Commerce PB L67780; April 1942. ABSTRACT: This document is a manual for the radio-beacon and direction-finding equipment Fu-Peil-A 1/ortsf. and contains the description of its principle, construction, and operation. Drawings, photographs, parts list, and diagrams included. (a-3, b-3, c-4, d-4, e-0, f-Description)

1452. DIECKMANN, M., "Faulty Indication of Shortwave Adcock Direction Finders Outside the Range of Ground-Waves," (German: D.A.L.)See: Air Document Index R3438 F362; April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1453. ESAU, A., "Directional Properties of Loop Antennas While Receiving a Given Number of Signals of Equal Wave Length," (German D.A.L.)See: Air Document Index R3438 F330; April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0-f-Loops)

1454. GIESECKL AND SCHACKY, "Radio Direction Finding," (German) Field Information Agency, Technical, Joint Intelligence Objectives Agency, Report 753:IIIC/3160; April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1455. MARWETT, D. E., "Four Dial Telemetering System," Hazeltine Corporation, Report No. 1286W; April 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1456. ROESSLER, E., "Directional Properties of Antennas when Receiving a Given Number of Signals of Equal Wave Length," (German D.A.L.) See:Air Document Index No. R3438 F349; April 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1457. STRUSZYNSKI, W., "Calculations of the Input Circuit of a D/F Receiver," Admiralty Signal Establishment (British) Report M, 414; April 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Circuitry)

1458. PETTIT, J. M., "Investigation of Compensation in Direction Finders," An Investigation of the Compensated Loop Direction Finder for Elimination of Polarization Errors (Night Effect), Contract No. NDCrc-159 with Leland Stanford Junior University, Stanford University, California, report dated 7 April 1942, for Communications Section, National Defense Research Committee of the Office of Scientific Research and Development. ABSTRACT: In this report is described a system for elimination or reduction of night effect and similar polarization errors of loop direction finders. These polarization errors are produced by the horizontally polarized component of downcoming waves arriving at the loop, and it is proposed to neutralize this undesired voltage by means of the voltage obtained from an auxiliary horizontal compensating antenna mounted on the loop structure and rotating with it. A basic feature of the system is the provision of a coupling network, in which an initial adjustment of magnitude and phase can be made for neutralizing the voltages for a particular direction-finding installation. Attempts by previous investigators, whose proposal depended upon perfect ground reflection, and which did not allow for adjustment of phase in the compensating circuit, have not yielded the promising results of the more generalized attack which is presented here. The initial compensating adjustment depends upon the ground-reflection conditions in the vicinity of the transmitter, the wavelength, height above ground, relative size and location of the loop and horizontal antenna, and angle of incidence of the wave. It is shown that once the proper initial adjustment has been made for a given installation there is a wide range of operating conditions, such as angle of incidence and wavelength, wherein the compensation will remain nearly perfect. A thorough theoretical analysis and investigation is presented, from which numerous important limits of practicability of the system can be predicted. It is concluded that the system can function at short waves as well as at long, and calculations are included for a range of one to 1000 meters. The system will function for locations on any type of soil having moderate conductivity, including "dry soil" of 10^{-11} e.m.u.. The system does not appear applicable to aircraft installations where there would be extreme changes in soil types while flying over water and various types of terrain. Another limitation on aircraft application is the inadequacy of the system to maintain compensation over large variations in height above ground. The system works best at fixed heights which are small compared to a wavelength ($\lambda/10$ or less). Extensive field tests have been performed which demonstrate the validity of the theoretical analysis by comparison between calculated and experimental results from various types of experiment. An actual demonstration of the application of the system to a commercial direction finder is reported. The source of signals was an elevated transmitter, with a short dipole antenna which could be rotated to provide horizontal, vertical, or intermediate degrees of polarization of the radiated wave. Without compensation the direction finder gave bearing errors ranging from 0° to 90°, depending upon the relative amounts of horizontal and vertical components in the downcoming wave. An initial adjustment of the compensating system reduced all the errors to 0°, even for horizontal components much larger than the vertical component. It was not within the scope of the project to produce a completely developed, working model, and hence the demonstration was performed for only a single frequency and angle of wave incidence. It is felt that this type of compensation system can give direction-finder dependability with a small, compact loop antenna that will be as good as that of the larger Adcock antenna, and should be applicable to all fixed installations and all mobile installations except aircraft. (a-1, b-3, c-1, d-1, e-711, f-Detailed experimental work later condensed into an IRE paper, see Abstract No. 2290)

1459. ANONYMOUS, "Construction, Installation and Tests of an Experimental Short Wave Direction Finder on Board Ship," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal 121; 7 April 1942. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1460. ANONYMOUS, "Ultra High Frequency Automatic Direction Finder for Aircraft," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal 122; 18 April 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1461. ANONYMOUS, "Polarization Errors of the W. E.-C.A.A. Direction Finder," National Defense Research Committee, Division 13, National Bureau of Standards Report: HL: ANK I-6 R 125.31n; 20 April 1942. ABSTRACT: The polarization errors of the W.E.-C. A.A. direction finder were measured by means of the method given in the National Bureau of Standards November 15, 1941 "Progress Report". This direction finder makes use of two fixed H-antennas at right angles to each other and gives a unidirectional bearing indicated on the screen of a cathode-ray oscilloscope. The derivation of the polarization errors for this system is given. This analysis shows that the unwanted antenna response causes the sideband and carrier branch voltages to be out of phase thus decreasing the output of the detector stage of the receiver. The polarization error thus varies with the relative phase of the wanted and unwanted antenna response voltages, the maximum polarization error occurring when the output voltages due to the parallel and perpendicular components of the incident wave are in phase. The maximum polarization errors are given as a function of downcoming angle and average ground constants for the airline frequencies of 3285, 4937.5, and 6210 kc. The corresponding vertical to horizontal pickup ratios are 1.7, 3.6, and 6.0 while the values of ϵ_0, the polarization error for horizontal wave incidence, are 30°, 15°, and 10°. Similarly, the corresponding values of the standard wave error are 42°, 37°, and 34°. These values must all be considered as approximations only. Calculations show that the polarization errors of this direction finder would be decreased by one half by decreasing the height of the center of the antenna system to approximately one-half its present value. Since this height is now 36.5 feet it would appear that a reduction in height would be feasible although a cut by a factor one-half would entail decreasing the length of the D/F dipoles. (a-1, b-3, c-1, d-1, e-789, f-Description)

1462. KANE, H. F., AND COYLE, C. R., "Report on British High Frequency Direction Finders as Used Ashore and Afloat in the Royal Navy," USN, Chief of Naval Operations, Washington, D.C.; 27 April 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1463. ANONYMOUS, "Description of Direction Finding Equipment by Fisher Research Laboratories," Fisher Research Laboratory, Palo Alto, California; 30 April 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1464. ANONYMOUS, "Description and Operating Instructions for Fixed Direction Finder Fu Peil A 60c," (German: Telefunken) See: Air Document Index No. R2336 F527; May 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1465. ANONYMOUS, "Installation and Operating Instructions for Direction Finder Fu Peil A 40g," (German: Telefunken) See: Air Document Index No. R2315 F285; May 1942. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1466. BOZORTH, R. M., AND CHOPIN, D. M., "Demagnetizing Factors of Rods," Journal of Applied Physics, vol. 13, no. 8, pp. 320-326; May 1942. ABSTRACT: A chart is constructed for converting the apparent magnetic permeability to the true permeability of cylinders of any given ratio of length to dia. The curves are based on previous calculations in which account was taken of the variation of the demagnetizing factor with permeability, but in which the permeability was assumed const. over any one cylinder. The flux distribution has been determined experimentally in several cylinders, and as the field acting on the specimen is increased from zero, the positions of the effective poles have been found to move toward the middle of the rod until (if the permeability is sufficiently high) they are located about 0·7 of the distance from the middle to the ends, and then to move toward and approach the ends as the permeability declines in high fields. (a-3, b-1, c-1, d-1, e-0, f-Experimental analysis)

1467. CRAMPTON, C., "Report on Trials of Wireless D/F Equipment in H.M. Submarine GRAPH," Admiralty Signal Establishment (British) Report: M. 424; May 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1468. McINTOSH, C. H., "Position-Finding by Waves," Engineer, vol. 173, p. 360; May 1942. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1469. JANSKY, K. G., "Study of Radio Pulse Propagation," Bell Telephone Laboratories; 1 May 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

1470. ANONYMOUS, "Portable Direction Finder .5 to 20 Mc," Federal Telecommunications, Nutley, New Jersey, Proposal No. 127; 2 May 1942. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

1471. ANONYMOUS, "Instructions for Model DZ-2 Aircraft Radio Direction Finder Equipment," U.S. Navy, NavAir 34-08-5Q-14; 6 May 1942. See also Department of Commerce PB15080. ABSTRACT: The Model DZ-2 Aircraft Radio Direction Finder Equipment consists essentially of a rotatable loop antenna, a radio receiver, and a dynamotor-filter. The equipment is intended for installation in all types of Naval heavier-than-air aircraft whose space limitations are such as to permit access for operation of the receiver and loop controls, and which, by absence of closed loops or other obstructions, permit successful direction finding. The equipment is designed for operation from an aircraft's 24-volt battery and serves either for radio reception or for direction finding. The Model DZ-2 equipment differs from the Model DZ-2A only in respect to the position in which the loop antenna is mounted. The loop antenna consists of the Loop Antenna Assembly, Type CRV-69065, and the Loop Drive Assembly, Type CRV-69064. The Loop Antenna Assembly is comprised of two center-tapped, shielded loop windings contained within a streamlined, waterproof housing. One loop winding is mounted inside of the other, and the two windings are so adjusted that their planes intersect at an angle of 90 degrees in order to prevent intercoupling. The inner winding is used for reception on frequencies between 100 kc and 1750 kc, the outer on frequencies between 15 kc and 70 kc. The two windings are rotated as a unit by a central shaft actuated by means of the loop drive assembly. The loop drive assembly consists of an azimuth scale, handwheel and brake assembly, and the loop drive extension. One end of the loop drive extension fastens securely in the base of the loop antenna assembly. The loop antenna assembly is intended to be rigidly mounted on the fuselage of the aircraft, the loop drive extension protruding down through the skin of the aircraft, serving as a support for the loop drive assembly. Bearings are ready by means of one of two indices and azimuth scales. The proper index and scale are at all times automatically selected by means of a relay. A vernier drive and brake are incorporated to permit minute adjustment and locking of the loop antenna in any desired position. The Radio Receiver, Type CRV-46152, covers in six bands frequencies between 15 kc and 70 kc and between 100 kc and 1750 kc. On frequencies below 200 kc the selectivity characteristic of the receiver is very sharp, adapting it primarily for the reception of cw or low-frequency tone-modulated signals. On frequencies between 200 kc and 1750 kc the selectivity characteristic is sufficiently broad to permit reception of either voice or tone modulated signals. The receiver is shock-mounted by means of the Receiver Mounting Base. (a-1 and 4, b-3, c-1, d-1, e-845, f-Instructions)

1472. ANONYMOUS, "Radio Equipment D/F Installation, Peilgerat 4," Air Ministry (British) AI/2 (G), Report 722, No. EA 26/3; 20 May 1942. ABSTRACT: Not available (a-4, b-3, c-1, d-5, e-0, f-0)

1473. WIRKLER, W. H., "Direction Finder Design for Medium High Frequencies," Collins Radio Company, Cedar Rapids Iowa, Report CER 109; 22 May 1942. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Design)

1474. SELIGMAN, J., "Field Tests of RCA Horizontal Loop Direction Finder within the Frequency Range of 5 to 10 Megacycles," Signal Corps Engineering Laboratory, Eatontown: Eng. Rpt. 768 (Coles: D/F Group); 29 May 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Field test of equipment)

1475. CLARK, T. H., "The Test of a Marine Short Wave Direction Finder," Federal Telephone and Radio Corporation, Technical Report No. 17; 30 May 1942. ABSTRACT: This report discusses calibration tests of a short wave Marine D/F. These tests were made on board a destroyer. (a-4, b-3, c-1, d-1, e 375, f-Calibration test on board ship)

1476. ANONYMOUS, "Construction and Operating Manual for the Radio Direction Finding Station Fu Peil A 80a, Transportable," (German: Telefunken) See: Air Document Index R2298 F657; OP-32-FS-A-8436-46; June 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instruction)

1477. ANONYMOUS, "Description and Method of Operation for Direction Finder FU Peil A 70e, Mobile," (German: Telefunken) See: Air Document Index R2331 F322; June 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1478. ANONYMOUS, "German Aircraft Radio," Electronic Engrg., vol. 15, pp. 8-12 and 36; June 1942. ABSTRACT: The FU.G. 10 set is described; it includes intercommunication, s.w. and l.w. on 4 spot frequencies, with a power output of 65W and a receiver sensitivity of 50 mW for 1μV input; direction finding; blind-approach equipment and l.w. pulse transmitter to assist bearings. The receiver a.f. circuits include iron-dust-cored inductances. Other sets briefly described are the FU.G. 16 and 2 emergency transmitters. (a-3, b-2, c-1, d-1, e-0, f-Description of German radios)

1479. ANONYMOUS, "Me 323 Direction Finding Experiments," (German: Tevar) See: Air Document Index R216 F833; June 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1480. ANONYMOUS, "Old and New Nomenclature for Army Radio Direction Finding Equipment," Signal Corps Wright Field Lib: D 13.3/20; June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-terminology and nomenclature)

1481. ANONYMOUS, "Preliminary Description and Operating Instructions for Direction Finder Mounting Table," (German: Telefunken) See: Air Document Index R2298 F657; June 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1482. GOLDSTEIN, M. K., "The Performance of the British FH-3 and the International Telephone and Radio Laboratories Crossed Loop Type High Frequency Direction Finders (Aboard USS Corry DD 463)," NRL Report R-1896. See also Department of Commerce PB109515; June 1942. ABSTRACT: 62 page report, including photographs, diagrams, graphs and tables covering the following equipment: (1) FH-3 direction finder; (2) HF radio direction finders and (3) radio direction finder loop antennas. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

1483. GUYENOT, E., "Land Influences in Direction-Finding with Metric Waves," Hochf: tech. u. Elek: akus, vol. 59, pp. 162-168; June 1942. See also Wireless Engineer, vol. 19 p. 578; December 1942. ABSTRACT NO. 1: A description of experiments with a half-wavelength loop in determining direction of incidence and polarization of arriving radio waves. The author summarizes with some general observations on errors in direction finding in the presence of reradiating objects. ABSTRACT NO. 2: The plane of polarization remains unchanged only with vertically or horizontally polarized radiation. Piloting is possible for distances of 30 km and more with and without the possibility of direct sight. With inclined plane of polarization the influence of reflecting surfaces leads to errors, but this effect may be used for approximate determining the permittivity of the soil and the relation between conductivity and frequency. A special reflector

method is described for determining the main direction of incidence in an interference field. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Description)

1484. METSCHER, "Additional Equipment of the Automatic Pilot K4u for Switching in the Direction Finder Station 5," (German: Siemens) See: Air Document Index No. R2201 F452; June 1942. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-Description)

1485. METSCHER, "Modification of Automatic Pilot 4Kd to Permit Coupling to Direction Finder Peil 5," (German: L.G.H.) See: Air Document Index R2307 F152; June 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Modification)

1486. SCHERER, "Report on Experiments with an Automatic Direction Finder Made by the Firm of Patin "(German) See: Air Document Index R2651 F135; June 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Experiment report)

1487. JANSKY, K. G., "H.F. Direction Finder Research," Bell Telephone Laboratory, N. Y. C., Project C-16; 1 June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Summary)

1488. BURGESS, R. E. "The Impedance and Effective Height of the Screened Loop Aerial," National Physical Laboratory (British) Report No. RRB/C. 51; 1 June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1489. ANONYMOUS, "Progress of Continued Research and Development of Polarization Errors in Short Wave Direction Finding," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal 134; 3 June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1490. ANONYMOUS, "Ultra-High Frequency Radio Compass for Aircraft," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 132; 5 June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1491. GOLDSTEIN, M. K., "The Proximity Effect of a Metallic Fence on a Navy Model DT Direction Finder," NRL Report No. R-1890. See also Department of Commerce PB17569; 19 June 1942. ABSTRACT: This report covers the work done thus far in investigating the proximity effect of metallic fences on a Navy model DT direction finder. The direction finder, fence section and local transmitter that were employed for this purpose is described and shown. Following this, curves are given showing the proximity effects of the fence section on the bearing deviations taken; on a local oscillator with the various controllable polarizations, local transmitting stations and transmitting stations at great distances. Also reported are the pronounced proximity effects on the bearings when resonant conductors were employed. The results of these tests show that in so far as bearings on local or distant stations are concerned in the frequency range of 2.5 to 28 mc, the worst effect contributed by a continuously bonded metallic fence did not produce deviations much greater than 4 to 5 degrees nor appreciably broaden the bearing minima. The worst fence proximity effect generally appeared near the highest operation frequencies (28 mc) and could be rapidly reduced by decreasing the frequency or increasing the fence to direction finder spacing. Conclusions, recommendations and bibliography as well as photographs and graphic data are included. (a-3, b-3, c-1, d-1, e-118, f-Errors)

1492. GOLDSTEIN, M. K., "The Performance of the British FH3 and the International Telephone and Radio Laboratories Crossed Loop Type High Frequency Direction Finders (Aboard USS Corry DD 463)," USN NRL Report No. R-1896; 20 June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Equipment evaluation)

1493. ANONYMOUS, "Polarization Errors of a Direction Finder with Spaced Loop Antennas," U.S. Bureau of Standards, Radio Section, Report No. LMP:ANK I-6 R125.310; 25 June 1942. ABSTRACT: This report presents the work done by the National Bureau of Standards on a high-frequency direction finder with spaced loop antennas. A major purpose was to compare results with horizontal and vertical orientation of the loop antennas. The loop antenna system used was a United Air Lines model, which had normally been used with the loop antennas vertical. The method of measurement involves the use of a local transmitter a few feet above the ground. The transmitting antenna is adjustable so that either vertical or horizontal polarization of the radiated field may be produced at the direction finder. A field intensity meter is required to measure the various components of the radio field at the direction finder. The voltage developed at the output of the antenna system is measured by the substitution method. A standard voltage generator is substituted for the antenna at the input terminals of the radio receiver, and the equality of the two voltages is indicated on an output meter. The details of the test procedure required some modification over those employed in the method of testing the dipole types of D/F antennas. Interpretation of measurements of response patterns of the spaced vertical coaxial type loop antenna system was found to be complicated by parallax pickup when a local transmitter was used to generate the radio waves. Polarization errors were calculated from measured values of k and h, the pickup factors of the antenna corresponding to the unwanted and wanted field components, respectively. These errors were calculated for three D/F heights above ground; i.e., 10, 30, and 50 ft. (a-1, b-3, c-1, d-1, e-784, f-Calibration analysis)

1494. ANONYMOUS, "Direction Finding System Associated with a Frequency Scanning Receiver," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 139; 27 June 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1495. PARKINSON, T., "Ionospheric and Field Intensity Measurements at Louisiana State University, July 1, 1941 to June 30, 1942," Office of Scientific Research and Development (OSRD) Report No. 715; See also Department of Commerce PB L87779; 30 June 1942. ABSTRACT: The two projects included in this contract were concerned with the continuous measurement of field intensities of selected radio transmitting stations and the regular recording of ionosphere reflections, respectively. The systems involved in the two projects were essentially those used by the Bureau of Standards for similar work, and the analysis of data has been conducted according to their recommendations. Much of the apparatus utilized had to be purchased and assembled, thus involving delays, which were added to in a number of instances by failure of defective parts and by unanticipated problems. The extremely high static level of this latitude added a serious difficulty and called for special treatment. The major problems of securing satisfactory data have now been solved, field intensity data has been reported regularly for many months, and ionosphere reflections have been recorded regularly for several months but still lack satisfactory calibrating arrangements. (a-3, b-3, c-1, d-1, e-0, f-Experimental study)

1496. ANONYMOUS, "EFB2 Electrical Remote Control Apparatus (for G 5 Direction Finder)," (German) See: Air Document Index No. R218 F403; July 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1497. BOUWKAMP, C. J., "Hallen's Theory for a Straight, Perfectly Conducting Wire, Used as a Transmitting or Receiving Aerial," Physica's Grav., vol. 9, pp. 609-631; July 1942. ABSTRACT: Hallen's general theory is simplified for the case of a straight uniform wire of infinite conductivity. From Maxwell's equations and the boundary conditions at the surface of the wire, the current distribution and hence the antenna field can be computed. The large constant Ω (= 2l of (2l/a), where 2l and 2a are, respectively, the length and diameter of the wire), is involved in a fractional formula for the antenna input impedance, both the numerator and denominator being given by power series in Ω^{-1}. Numerical values of the coefficients of Ω^{-1} and Ω^{-2} are given, so that for $0 < 2\pi l/\lambda < 5$, the antenna impedance can easily be computed ($\Omega > 10$). The wavelength and radiation impedance at the first and second point of resonance are given, the calculations including the second-order corrections for the finite diameter of the wire. If used as a receiving antenna, the wire is supposed to be parallel to the incoming electric field. An antenna form factor is defined. The loaded receiving antenna behaves as a generator with internal impedance equal to the input impedance of the wire when used as a transmitting antenna. (a-5, b-1, c-1, d-Netherlands, e-0, f-Theory)

1498. CRAMPTON, C., AND STRUSZYNSKI, W., "Sense Finding with HF D/F in H.M. Ships," Admiralty Signal Establishment (British) Report M. 435; July 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1499. DASER, F. M., ZISLER, J., AND BERNDORFER, F., "On High Frequency Technique and Aviation Radio Research," (German: D.L.V.); OP-32-F2-E-1847-46; July 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1500. RUNGE, W., "Wireless Position-Finding," Hochf: tech. u. Elek: akus, vol. 20, p. 28; July 1942. See also Wireless Engineer, vol. 20, p. 37; January 1943. ABSTRACT: Position-finding by pulse transmission to two receiving/transmitting station and measurement of the two path times. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1501. DIAMOND, H., LYONS, H., LIFSCHUTZ, H., AND POAST, L. M., "High-Frequency Direction Finder Apparatus Research by National Bureau of Standards, 1941-1942," Communications Section, National Defense Research Committee of the Office of Scientific Research and Development, National Bureau of Standards, Washington, D. C., Project No. C-18; See Department of Commerce PB110897; 1 July 1942. ABSTRACT: 194 page report investigating the characteristics of direction finders, particularly polarization errors, both theoretically and experimentally. A study was made of the polarization of ionospheric radio waves and the effect of fading and ground reflection on the polarization of the total field at the direction finder determined. Optimum antenna heights for direction finders were determined. General expressions were derived for the polarization errors of any direction-finder antenna system. A method of measuring ground constants and its application to direction-finder site problems were developed. It was shown that the polarization error depended on the pickup ratio, h/k, where the pickup factors, h and k, were fundamental constants of the antenna system, determined experimentally. The "horizontal wave error", ϵ_0, defined in the usual case by $\tan \epsilon_0 = \frac{k}{h}$, was proposed as a figure-of-merit for polarization error in direction finders. It is independent of the ground constants or the height of the direction finder above the ground. A knowledge of the pickup ratio allows the determination of the maximum polarization errors of a direction finder (for any downcoming wave); the technique hitherto used for Barfield's "standard wave error" has neither of these advantages. Experimental techniques were developed for determining the horizontal wave error, and its value was determined for a number of direction finders. The values (averaged over the frequency ranges covered) were: W.E.-C.A.A., 25°; SCR-551, 15°; Navy DY and Experimental H, 10°; Collins CXAL and spaced verticalloop antenna, 5°; spaced horizontal loop antenna, 2°. Direction finders using loop-antenna elements were found to be inherently easier to balance and shield to reduce polarization errors than direction finders using open-antenna elements. The spaced horizontal loop-antenna D/F was found to have low susceptibility to site errors caused by local reradiation. The spaced horizontal loop-antenna D/F, provided its height above ground is not too far from a quarter wave length (or an odd multiple thereof), has the least polarization errors of all the types tested. (a-1, b-3, c-1, d-1, e-395, f-Theory and experiment)

1502. BLODGETT, E. D., "Summary of British Direction Finding Systems," National Defense Research Committee, Division 13, Section C-1 National Bureau of Standards; 6 July 1942. ABSTRACT NO. 1: This report covers the British Direction Finding equipment and typical installations in use by the Services and outlines developments which are being undertaken by various laboratories. It is the purpose of this report to describe the Direction Finding Equipment in use at the present time, and certain proposed developments. It is believed that the operational uses are thoroughly understood by military personnel and these have been omitted, except where a general reference serves to illustrate a necessary point. In estimating the value of certain equipments in respect to our requirements, it should be remembered that fixed, rather than mobile, equipment satisfies many conditions peculiar to a defensive location. The development of a few units having certain fundamental limitations which confine their use to bearings obtained from direct or ground waves has been an engineering compromise resulting from the necessity to rapidly utilize available means. Difficulties encountered by the lack of electrical perfection, however, can be overcome in many instances by intelligent operation. The amount of information thus made available depends upon careful thinking on the part of the research and intelligence organizations which are closely linked with the operating establishments. ABSTRACT NO. 2: The report table of contents includes the following listings: medium and high frequency loops and high frequency Adcocks of the buried U type, cathode ray tube indicators, dot-lock ray separation methods, VHF Adcocks of the H type, spaced loops, crossed loops, sites, ground mats, standard wave error, and other miscellaneous listings not repeated here. The report also describes a system employing four spaced loops which was considered and abandoned as fundamentally incorrect. In the system considered, the plane of each loop was parallel. The planes of one set of loops were parallel to the supporting cross arm and the plane of the second set was at right angles to the second supporting arm. The magnetic linkage from the supporting pedestal, as well as the linkage from the cross arms, coupled unequally into each loop pair. (a_1-1, a_2-4, b-3, c-1, d-1, e-29, f-Survey of British D/F equipment)

1503. HANDEL, P. VON, "Limiting Accuracy of Long Distance D/F and Range Determination," Field Information Agency, Technical, Joint Intelligence Objectives Agency, Reports 753:IIIC/3164; 677, Report 136; and No. 753IIC/106; 10 July 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1504. ANONYMOUS, "Provisional Directions for Handling CH I (1) Mark 1 Radio Direction Finder (Japanese)," Army Air Force Air Technical Conference No. 1747; Report No. OP-16-FE Translation No. 274; 13 July 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-6, e-0, f-0)

1505. CRAMPTON C., STRUSZYNSKI, W., AND MLODUCHOWSKI, J., "A Note on the Application of Spaced Loop HF D/F in H.M. Ships (Present State of Development)," Admiralty Signal Establishment (British) Report No. 433; 20 July 1942. ABSTRACT: (1) The existing HF D/F Outfits of the type FH3 and FH4 fitted in H.M. Ships are giving fairly satisfactory results as far as bearings and sense finding on the ground wave are concerned. Their accuracy is fairly good on some frequencies and in some sectors of relative bearing. (2) The antenna used in these outfits is ordinary crossed loop system which gives large polarization errors when sky wave is present. (3) The only criteria for discrimination between ground and sky wave are increased of blurring, fading of signal and variation of bearing which are generally rather difficult for operators to detect. (4) Investigations are being carried out in several directions to develop improved HF D/F apparatus for H.M. Ships and among these a certain amount of work has been done in connection with spaced loops. The two main objects of this work have been to ascertain: (i) What design of spaced loop system is most suitable for the purpose; (ii) What advantages are to be gained in performance and operation over the present ordinary crossed loop. (5) The spaced-loop D/F system provides an arrangement which will give accurate bearings on the sky wave as well as on the ground-wave; i.e., polarization errors are eliminated or very much reduced. (a-1, b-3, c-1, d-5, e-63, f-Evaluation report)

1506. ANONYMOUS, "Comparison of Operational Characteristics of VHF Adcocks 'tornado' and 'Division F'," Field Information Agency, Technical, Joint Intelligence Objectives Agency 677, Report 52; August 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1507. ANONYMOUS, "Description and Operating Manual for the Stationary Radio D/F Installation Fu Peil A 50b," (German: Telefunken) See: Department of Commerce PB54897; August 1942. ABSTRACT: This is a technical manual dealing with the permanent (stationary) direction-finding installation Fu Peil A 50b. Abstract prepared at Headquarters Air Material Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Description)

1508. ANONYMOUS, "Direction Finding Receiver 'Martha 1 b'," (German: Telefunken) See: Department of Commerce PB L70541; August 1942. ABSTRACT: This document is a parts list for the direction finding receiver "Martha 1 b". The abstract was prepared at Headquarters, Air Material Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-0)

1509. ANONYMOUS, "Flight Safety. Part 2. Radio Direction Finding at Ground Radio and Direction Finding Stations," (German) See: Air Document Index No. R2113 F809; August 1942. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-Manual)

1510. ANONYMOUS, "Test Manual for the Test Transmitter 'Oskar'," (German: Telefunken) See: Air Document Index No. R2077 F5299; August 1942. ABSTRACT: Not available. (a-4, b-3, d-4, e-0, f-Manual)

1511. CRAMPTON, C., AND WHIPPLE, R.T.P., "H/F D/F Afloat. Discrimination Between Ground and Sky Wave and Range-Estimation," Admiralty Signal Establishment (British) Report M446; August 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1512. WESTFEHLING, "Testing Transmitter for Direction Finding Installation Peil G.4," (German Telefunken) See: Air Document Index No. R2305 F77; August 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Test report)

1513. WHIPPLE, R. T. P., AND MUGRIDGE, A. H., "The Characteristics of a Vertical Antenna," Admiralty Signal Establishment, Report M. 389; August 1942. ABSTRACT: This report presents a mathematical analysis of a general linear reradiator. The essential results in terms of amplitude and phase of the reradiated field as a function of distance are summarised by Crampton, see no. 2766. (a-5, b-3, c-1, d-5, e-310, f-Analysis)

1514. WIRKLER, W.H., "Explanation of Complete Schematic Direction Finder with Three Antenna Pairs and Automatic Balancing." Collins Radio Company, Cedar Rapids, Iowa; 8 August 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1515. STRUSZYNSKI, W., AND REDGMENT, P.G., "Improvements Developed up to July 1942 in Sense Finding for Incorporation in Existing H/F D/F Installations," Admiralty Signal Establishment (British) Report No. M.438; 9 August 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Survey)

1516. HANSEL, P.G., "British Radio Direction Finder," Signal Corps Engineering Laboratory, Eatontown, RDF-3-33 (Coles: D/F Group); 12 August 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1517. ROSS, W., "The Calibration of Short Wave Adcock Direction Finders (Wavelength 10 - 100 Metres)," National Physics Laboratory (British) RRB/C.57; 17 August 1942. ABSTRACT: Not available. (a-4, b-3, c-1 d-5, e-0, f-Description of calibration technique)

1518. LUCK, D.G.C., "Further Studies of Errors in High Frequency Direction Finders," RCA Manufacturing Company, Camden, New Jersey, Project No. C-38; 25 August 1942. ABSTRACT: The work here reported is essentially a continuation of that done under Project C-17. Review of high-angle measuring methods indicates balloons still to be the best elevating agent, but has led to redesign of working rigging. Purity of polarization of the test transmitter used in both projects has been measured and found to be exceptionally good and quite adequate. Test of a counterpoise of insulated wire rings has shown it to be especially ineffective. Measurement at six frequencies of the stray pickup of the Bell Telephone Laboratories experimental Adcock at Holmdel, for a wide range of wave-arrival elevation, has shown a minimum of unwanted effect at a surprisingly constant elevation, with no corresponding field minimum present. Standard-wave errors computed directly from the observations range from 2 to 9 degrees over the range 15 to 5 megacycles. No significant voltages could be found across the ground mat of this system. Analysis of the results of Project C-17 has given good correlation of the observations at different elevations. For the Holmdel results, no such correlation has been found; the error minimum consistently observed at an elevation of about 5 degrees has not yet been adequately explained. In this analysis, fields produced at the Adcock system by the local test transmitter have been computed both on plane-wave and on general theory; the latter method has given in most cases a much greater vertical component than the former, especially at low frequencies and elevations. This means that local transmitter tests are generally much too favorable if taken at face value. In the Holmdel case, the standard-wave errors corrected to distant-signal conditions become so great at low frequencies than they are not easy to accept as correct, though we cannot now explain them away. The structure of the elevated-counterpoise Adcock of Project C-17 is generally suitable for transportable use and is quite free from instrumental errors. Recent observation of the rather poor performance of many other systems has led us to improve our opinion of the C-17 system and to lay down rules for the design of such systems. Needed improvement in direction finders might be obtained by using a directive diversity principle, to insure efficient reception of any usable signal, and auxiliary warning means to prevent taking bearings on unusable signals. Two proposals to decrease unwanted pickup presuppose voltages across ground mat conductors but are offered anyway. Both balanced-H and shielded-U Adcocks seemingly should be very good, but are not, showing our understanding of them to be still inadequate. Effects of ground are always present and usually complicated; they may be favorable or unfavorable but are in either case more pronounced the better the ground. The U-Adcock, at the ground surface, has a basic advantage over elevated types in that for it the ground effect is always favorable. Good ground cannot fully cure a bad direction finder. Because of incomplete present knowledge, too much reliance should not be placed on separation of direction-finder properties from ground effect, or on extrapolation from observations to performance under widely different circumstances. Enhancement of local vertical fields means that these should always be measured directly or computed by complete theory to avoid mistakes; presence of unwanted polarization components in local fields is another possible source of error. To avoid phasing difficulties, separate measurements should be made with wanted and unwanted field components present singly. Several elevations should be measured to avoid overlooking peculiarities, and in general, tests should be made searching to show up possible troubles clearly. The arbitrary but direct and definite standard-wave error still seems as good a single criterion of performance as any, but may require generalization to cover all types of wave-collector. Pickup ratios may become very useful criteria when we know enough to use them to best effect. (a-1, b-3, c-1, d-1, e-189, f-Summary)

1519 ANONYMOUS, "Technical Manual - Radio Set SCR-255," U.S. War Department Technical Manual No. 11-861. See also Department of Commerce PB22014, 28 August 1942. ABSTRACT: This operating and maintenance manual covers a semiportable, ground-station radio direction finder covering the frequency range of 550 kc to 30 mc. It is designed to operate as an aural null direction finder employing a rotating Adcock antenna system. Parts lists, dimensional drawings, photographs, and diagrams are included. The manual was published by Wilcox-Gay Corporation. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1520. ANONYMOUS, "Adcock System Direction Finder," Hochf:tech. u. Elek:akus, vol. 60, p. 80; September 1942. See also Wireless Engineer, vol. 20, p. 143; March 1943. ABSTRACT: Superheterodyne receivers connected to two antennas are supplied with heterodyning oscillations from a central antenna excited by the oscillator: I/F oscillations thus produced are radiated to a goniometer connected to another central antenna. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1521. ANONYMOUS, "Description and Operating Instructions for Fixed Direction Finder Peil A 40e," (German: Telefunken) See: Air Document Index No. R2296 F574 and R2322 F183; September 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description and instructions)

1522. ANONYMOUS, "Direction Finder Fu Peil A 70a, Model 351aF," (German:Telefunken) See: Air Document Index No. R2272 F193; September 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1523. ANONYMOUS, "Fixed Direction Finder, Fu Peil A 70a," (German-Telefunken) See: Air Document Index No. R2311 F772; September 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1524. ANONYMOUS, "Handbook of Instructions for Model MN-31 Series Automatic Radio Compass Equipment," Bendix Aviation Corporation, Baltimore, Maryland, Tech Order No. 16-10-85. See also Department of Commerce PB46364; September 1942. ABSTRACT: Not available. (a-3, b-3, c-1, d-1, e-0, f-Instruction handbook)

1525. ANONYMOUS, "Instruction Book for Model AN/ARD-1 Aircraft Radio Receiving Equipment," Midwest Radio Corporation, Cincinnati, Ohio. See Department of Commerce PB38628; September 1942. ABSTRACT: Model ARD-1 equipment is a nonradiating early warning receiver designed: (1) to detect radar signals beyond the effective range of the radar, (2) to measure carrier frequencies and pulse repetition rates, and (3) to locate radar transmitters by means of directive bearings. It is intended primarily for use on submarines and planes. Radar signals can be heard on this equipment at two or three times the effective range of a radar system. The receiver consists of an antenna-detector unit, an amplifier, and an AD or DC power supply. The antenna-detector unit is mounted at an angle of forty-five degrees for reception of either horizontal or vertically polarized waves. A minimum signal strength of one millivolt per meter is required for operation from 85 to 1000 megacycles. The antenna-detector unit is composed of a slotted line, on antenna rod, and diode detector. The antenna rod is an extension of the inner conductor of the slotted line and is supported at the top of the slotted line by a styranic insulator and at the bottom by a clamping chuck. The electrical length of the slotted line is adjusted by a slider, which connects the inner and outer conductors. The detector tube is located at the top of the line in order that the diode plate may make a short connection to the base of the antenna. The receiver is tuned by moving the slider on the slotted line. The electrical length of the line is read on a centimeter scale opposite an indicator on the handle of the slider. The length is a function of frequency and the carrier frequency of a received signal is determined from a calibration curve. The amplifier is composed of a three stage video amplifier, trigger circuit, pulse frequency meter, a visual fre-

quency meter, a visual tuning indicator, and a stage of audio amplification. Photographs, drawings, diagrams, charts, curves and a parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1526. ANONYMOUS, "Preliminary Specification Direction Finding W/T Outfits, FH4X and FH7," Admiralty Signal Establishment (British) Report No. B154/42; September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

1527. ANONYMOUS, "Problems of a Long-Range Aerial Task Force Operating over Water," (German) See: Air Document Index No. R199 F603; September 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1528. ANONYMOUS, "Provisional Instrument Manual for the FuG 141," (German:Lowe) See: Air Document Index No. R2028 F803; September 1942. (a-4, b-3, c-4, d-4, e-0, f-0)

1529. ECKERSLEY, T. L., "The Investigation of Horizontally and Vertically Polarized Direction Finding on Frequencies of the Order of 20 to 70 Megacycles per Second," Admiralty Signal Establishment (British) Report BW TR/451; September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1530. GROSSKOPF, J., AND VOGT, K., "Influence of Ground Characteristics on the Ground-Wave Field," (German) See: Field Information Agency, Technical, No. 677, Report 86; September 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1531. GROSSKOPF, J., AND VOGT, K., "The Effect of Inhomogeneities on the Ground Wave Field," (German) See: Field Information Agency, Technical, No. 677, Report 198; September 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1532. KUMMICH, R., "Adcock-System Direction-Finder," Hochf. tech. u. Elek: akus, vol. 60, p. 80; September 1942. See also Wireless Engineer, vol. 20, p. 143; March 1943. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1533. ANONYMOUS, "Instructions for Calibrating Shipboard HF Radio Direction Finder," Naval Research Laboratory Letter Report RA 69A 221; 4 September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration instructions)

1534. ANONYMOUS, "Instructions for the Shipboard Installation of Model DAR High Frequency Radio Direction Finder," Naval Research Laboratory Letter Report No. RA 69A 220; 5 September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Installation instructions)

1535. GOLDSTEIN, M.K., "Preliminary Instructions for Model DAR High Frequency Radio Direction Finder," Naval Research Laboratory Letter Report No. RA 69A 221a; 5 September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1536. ANONYMOUS, "Radio-Conf. Contract Nos. 98284 - Model DAG Portable D/F - Airplane and Marine Instruments, Inc., Contractor-Investigation and Correction of Design Faults," Naval Research Laboratory, Letter No. C-S67/69(342); 7 September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-536, 520, f-Modification specifications)

1537. ANONYMOUS, "Radio-Report on Examination and Tests of Portable L.F. Loop Type DF, Model DN-200B, Manufactured by Garod Radio Corporation, Brooklyn, New York," Naval Research Laboratory Letter No. C-S67/69; 7 September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1538. GOLDSTEIN, M.K., "Specifications for Minimum Direction Finder Site Requirements," NRL Report No. R-1938. See also Department of Commerce PB17571; 19 September 1942. ABSTRACT NO. 1: The report establishes general site and environment requirements for the selection of direction finding sites by means of visual inspection of maps and figures as well as the site itself. Principal site factors are listed and their estimated effect on direction finder accuracy is stated. Some of the factors considered include coastal deviations, terrain deviations, substrata discontinuities particularly conductivity discontinuities, buried conductors, surface obstructions, buildings, etc., and various other physical conditions which can be associated with the site. ABSTRACT NO. 2: The object of this investigation has (a) to establish site and environment requirements in order to permit the selection of promising direction finder sites by means of visual inspection and suitable maps and photographs, (b) to establish minimum direction finder site requirements in order to evaluate the merits of different sites. Sections of the report deal with known effects bearing on the problem, preliminary choice of a direction finder site, electrical characteristics to be determined in the choice of a direction finder site. An appendix, bibliography and drawings of station layout are included. (a_1-4, a_2-3, b-1, c-1, d-1, e-119, f-Specifications)

1539. ANONYMOUS, "Radio - Model DAF RDF Equipment - E.M. Shargent Company, Oakland, California, Contractor - Test of Production Model - BuShips Problem D-17-C," Contract No. 99789 Naval Research Laboratory Letter Report No. C-S67/69(342); 19 September 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1540. ANONYMOUS, "Description and Operating Instructions for Test Transmitter APS 4," (German:Telefunken) See: Air Document Index No. R2292 F749; October 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1541. ANONYMOUS, "Fu Peil A3a (1sq. Meter Frame Direction Finding Equipment) Installation Handbook," (German) See: Air Document Index No. R2152 F918; October 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1542. ANONYMOUS, "Portable DF Equipment, Type DFP-4," Air Ministry (British) Publication No. 1186B; October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1543. ANONYMOUS, "Preliminary Description and Operation Instructions for Test Equipment Used for Testing Direction Finder Equipment Made by Patin," (German) See: Air Document Index No. R2335 F677; October 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1544. KUMMICH, R., "Cathode-Ray Direction Finder Working with Rotating Antenna and an Auxiliary Deflecting Field Producing Alternate Leads and Lags in Rapid Succession," Hochf:tech. u. Elek:akus, vol. 60., p. 115; October 1942; See also Wireless Engineer, vol. 20, p. 619; December 1943. ABSTRACT: The auxiliary field works so that the points on two directional curves appear alternately on the screen; their point of intersection yields the correct direction. This is intended to overcome blurring evident in the usual indication. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1545. NEWSTEAD, G., "Limits of Use of the Crossed Buried U Adcock High Frequency Cathode Ray D/F, "Directorate of Signals Royal Australian Air Force, October 1942. ABSTRACT: This report reviews the field of direction finding in the frequency range 1.67 to 8.6 mcs using the Cathode Ray Adcock H/F D/F. It is a survey of the work of many investigators and is believed to be, in itself, a complete and up to date picture of high frequency D/F using the cathode Adcock system. Included in the report are the results of an extensive aerial survey of eight high frequency D/F stations by the Royal Australian Air Force. (a-4, b-3, c-1, d-11, e-196, f-Survey)

1546. TOCZYLOWSKI AND WHIPPLE, R. T. P., "Damping Reradiation Parts I and II," Admiralty Signal Establishment (British) Report M.447; October 1942. ABSTRACT: The report describes methods of reducing reradiation from typical shipboard vertical structures by means of inserting resistive components in series with external return circuits attached to the deck or grounding surface, and the reradiator at appropriate points. A great many experiments are described including the use of multiple additional return circuits with resistance inserted. Results of these experiments generally show that at a given frequency a total reradiated field can be greatly reduced but that if a wide range of frequencies is considered, the total error averaged over the entire range may not be significantly improved. (a-4, b-3, c-1, d-5, e-0, f-Technical instructions)

1547. ANONYMOUS, "Demountable Direction Finder Type 502-Instantaneous Indication by Cathode Ray Oscilloscope," Federal Telecommunications Laboratories, Technical Memoranda No. 26; 7 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1548. CRAMPTON, C., AND STRUSZYNSKI, W., "Naval H/F D/F Outfit FH3. The Symmetry of the D/F Aerial System and Sense Arrangements," Admiralty Signal Establishment (British) Report M. 454; 7 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1549. HASKINS, R. L., AND HARRIS, F., "Report on Model DAJ DF Installation at Amagensett, New York," Naval Research Laboratory Letter No. C-S67/69; 10 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Installation report)

1550. KAUFMAN, "Description of Tests Carried Out for Admiralty of a Directional Control System Based on a Comparison of Phase of Two Radiated Signals," U. S. Navy; 12 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test description)

1551. ANONYMOUS, "Radio-Selection of HF/DF Sites-Installation of Model DAJ, DAH, and DAH-1 DF Equipment, Mfg under Navy Cont C-NXs-1748, and Model DAB D/F under Contract No. 91550-Forwarding of Information Relative to Site," Naval Research Laboratory Letter Report No. C-S67/69 (480 G-474); 13 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-D/F site descriptions and installations)

1552. ANONYMOUS, "Report on a Cathode-Ray Direction Finder," Australia and New Zealand Scientific Research Liaison Office, Report No. 198; 13 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-10 and 11, e-0, f-0)

1553. ANONYMOUS, "Description of Rotating Frame Submarine D/F Set Type 280S with Direction Finder Frame Type 1000 NIX and Heterodyne D/F Receiver T3pLLa38,' (German:Telefunken);19 October 1942. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1554. ANONYMOUS, "Radio-Confidential Contract Nos-99866-Model DAE RDF-Radio Marine Corporation of America, Contractor-Test of Production Model-Bureau of Ships Problem No. D18C," Naval Research Laboratory Letter Report C-S67/69(342); 30 October 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Equipment test)

1555. ANONYMOUS, "Fundamentals of Physics as an Introduction to Radio, Direction-Finding, and Telephone Technique," (German: L.N.S.) See: Department of Commerce PB L71058; November 1942. ABSTRACT: This is an instruction manual on basic principles of electrical circuits and elements. (a-3, b-3, c-4, d-4, e-0, f-Theory instruction).

1556. ANONYMOUS, "Models DP-18, DP-19, Radio Direction Finder Equipment Frequency Range in 100 - 1500 K.C., A.C. Operation," Radio Corporation of America, Camden, N. J., Instruction Book No. IB-38228. See also Department of Commerce PB17770; November 1942. ABSTRACT: The instruction manual covers the installation, operation, and servicing of the DP-18 and DP-19 direction finder equipment. This equipment manufactured for the Navy Department, Bureau of Ships, is designed to operate from 115 volt, 60 cycle, single phase service. The receiver is of the superheterodyne type and covers the frequency range of 100 to 1500 kc. When properly installed and calibrated the equipment will accurately indicate the direction and propagation of pure or modulated continuous wave signals, either keyed or unkeyed, at any frequency within this band. The receivers for these equipments have an antenna input protective relay and neon protective device. The relay is equipped with back contacts which ground the antenna input circuit when the receiver is not in use. The neon protective device bypasses high voltages which may be induced from nearby transmitting antennas when the receiver is in operation. An electronic output indicator also has been added, which aids in taking bearings on C-W signals. Photographs, diagrams, and curves illustrate the text. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1557. ANONYMOUS, "Radio Direction Finding Equipment. A Edition," NRL Letter Report No. RA-13A-251A. See also Department of Commerce PB28502; November 1942. ABSTRACT: These specifications cover general requirements for Direction Finding Equipment suitable for use aboard all types of U. S. Naval vessels or at Naval shore stations. Applicable subspecifications are listed, followed by general specifications for materials. Type tests on components are enumerated, and general instructions for making and furnishing drawings and instruction books to accompany equipment are also included. (a-3, b-3, c-1, d-1, e-0, f-Specification)

1558. GERHARD, E., "Arrangement for the Detection of an Object Moving in an Electromagnetic Radiation Field," Hochf: tech. u. Elek: akus, vol. 60, p. 147; November 1942. See also Wireless Engineer, vol. 20, p. 253; May 1943. ABSTRACT: Part of the energy from the unmodulated transmitter "1" arrives at the receiver "3" after reflection at the object "2" by the path "5-6"; which includes the reradiation "10" modulated by a modulator "7," and produces interference at the receiver. By this method of modulation with an easily-amplified frequency, small frequency fluctuations at the transmitter are rendered harmless and the full energy of the main beam "5" can be utilized. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1559. NIESSEN, K. F., "On the Approximate Ground-Absorption Formula for Vertical Dipoles," Physica's Grav., pp. 915-922; November 1942. ABSTRACT: Not available. (a-4, b-1, c-4, d-12, e-0, f-0)

1560. ROBERT, C. H., "Directional Equipment for Aircraft," Bull. Assoc. Suisse Elect., vol. 23, pp. 659-666; November 1942. See also Science Abstracts, vol. 46, p. 156; August 1943. ABSTRACT: A general description of D/F receiving equipment for aircraft and for ground stations. Loop antennas alone are considered, and their basic operation of up-to-date equipment are included. (a-6, b-1, c-3, d-13, e-0, f-Description of equipment)

1561. STEIN, F., AND MARRE, E., "Elimination of Quadrantal Error in Loop-Antenna Direction Finders Mounted in Swaying Vehicles," Hochf: tech. u. Elek: akus, vol. 60, p. 146; November 1942. See also Wireless Engineer, vol. 20, p. 253; May 1943. ABSTRACT: To compensate for reradiation effects, the axis of rotation of a loop antenna may be so inclined to the polarization direction of the incoming waves that the resulting decrease in sensitivity just counteracts the field strength increase due to reradiation. To make this plan still serve in the case of swaying vehicles, it is proposed to fit (at the back of the vehicle) two loops R_1 and R_2 rotated by a common drive, connected in series or parallel to the receiver, and inclined in opposite sense to the direction of polarization, at an angle 2 arc V sin f max where f max is the maximum value of the quadrantal error. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1562. STRUSZYNSKI, W., AND MARSHALL, J. H., "Symmetrical Screened Transformers as Used in H/F DF Circuits," M. 453, Serial No. 29, D/F Section, Admiralty Signal Establishment; November 1942. ABSTRACT: An error analysis of symmetrical screened transformers for direction finding applications. The essential material in this report was declassified and published by Struszynski and Marshall in the JIEE, vol. 94, Part IIIA, p. 857; 1947. (a-4, b-3, c-1, d-5, e-241, f-Analysis of error in components used in D/F)

1563. LOUGHREN, A. V., AND LARSON, G. C., "U.H.F. Friendly Aircraft Locator," Hazeltine Corporation:1430W; 11 November 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1564. WIRKLER, W. H., "Proposal-Polarization Error Test," Collins Radio Company, Cedar Rapids, Iowa, Report:CER111, Appendix III; 16 November 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1565. ANONYMOUS, "Investigation of Sources of D.F. Error in M.R.V. Proposed Modification to Switches Type 546 & 600," Royal Aircraft Establishment (British) Report:RAD/S4031/TLSB/136; 19 November 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Study)

1566. BOOTH AND MUMFORD, "An Aperiodic Capacitive Radio-Goniometer and Its Application to a Buried U Adcock D.F. (130-1500 Kc/s)," General Post Office (British):834; 21 November 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1567. ANONYMOUS, "Mobile Lorenz Long Wave Direction Finder Installation Fu Peil A 40 f.," (German:Lorenz) See: Air Document Index No.R2290 F616; December 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1568. ANONYMOUS, "Preliminary Short Description and Operational Directions for Airborne Direction Finding Set Peil G VI, with the APZ 6 Attachment," (German:Telefunken) See: Air Document Index No. R2077 F593; December 1942. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1569. BERGTOLD, F., "Direction Finder with Cardioid Diagram," Hochf: tech. u. Elek: akus, vol. 60, p. 177; December 1942. See also Wireless Engineer, vol. 20, p. 401; August 1943. ABSTRACT: If a directive aerial is employed together with a non-directive auxiliary aerial to yield a cardioid diagram (as for example in a "flicker" direction finder), the voltage from the auxiliary aerial can, without danger of any error in the reading, be amplified separately and led to the receiver through an arbitrary transmission system producing uncontrolled phase rotations, provided that the "blurring" voltage of the directive aerial is compensated in the formation of the cardioid. (a-1, b-8, c-4, d-4, e-0, f-Patent description)

1570. FISCHER, F. A., "Direction-Finding System with Opposed Single Antennas," Hochf: tech. u. Elek: akus, vol. 60, p. 177; December 1942. See also Wireless Engineer, vol. 20, p. 400; August 1943. ABSTRACT: The leads from the aerials to the point where they are opposed take the form of continuous choking coils, to decrease the formation of sheath waves and to be free from any freely-oscillating parts. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1571. GOTHE, A., AND HASSELBECK, W., "Adcock Antenna System," Hochf: tech. u. Elek; akus, vol. 60, p. 177; December 1942. See also Wireless Engineer, vol. 20, p. 401; August 1943. ABSTRACT: To reduce the effects produced in the vertical conductors of an Adcock aerial by the currents flowing in the horizontal leads and their sheathing, the leads and sheathes are extended by extensions similar to the necessary ones so that on both sides of the vertical wire, equally-large currents flow in the horizontal leads, their fields cancelling out in the direction of the vertical conductor. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1572. RUNGE, W., "Direction Finding Free from Night Error," Hochf: tech. u. Elek: akus, vol. 60, p. 177; December 1942. See also Wireless Engineer, vol. 20, p. 400; August 1943. ABSTRACT: In order to allow an antenna system which receives only the field components with horizontal (or vertical) polarization to yield bearings only at times of favorable conditions, an auxiliary antenna is provided which is susceptible to polarization and interference-fading, and its signals are made to block the indication of bearings whenever the signals fall below a certain limiting value. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1573. STEPHAN, A., "Device for the Correction of Errors in the Readings of Direct-Indicating Direction Finders," Hochf: tech. u. Elek: akus, vol. 60, p. 177; December 1942. See also Wireless Engineer, vol. 20, p. 401; August 1943. ABSTRACT: The error-containing oscillographic or stroboscopic bearing image is projected onto a screen by means of an optical arrangement (for example, a rotatable or swinging prism system) which is controlled by the correction figure. (a-1, b-8, c-4, d-4, e-0, f-Patent description)

1574. LARSON, G. C., LOUGHLIN, B. D., AND CRAIN, J. T., "Instruction Book, UHF Friendly Aircraft Locator. Part I of II and Part II of II," Hazeltine Corporation Report 1429W; 2 December 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

1575. ANONYMOUS, "Radio Report on U.S.C.G.C. CampBell-Installation and Calibration of Model DAR HF DF (Sec. No. 3)," Naval Research Laboratory Letter Report No. C-S67/69(342); 5 December 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Installation and calibration report)

1576. HORNER, F., "An Experimental Spaced Loop Direction Finder for Very High Frequencies," National Physics Laboratory (British) Report:RRB/c.62; 11 December 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-See later Abstract No. 2777; March 1947)

1577. SCOTT, J. M. C., "Angular Errors in R.D.F. Which Vary with Receiver Tuning," Air Defense Research and Development Establishment, Ministry of Supply (British) Report No. 181; 20 December 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1578. BUSIGNIES, H., ET AL., "Study of Dipole Direction Finder Antenna (Elevated H)," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 30, OSRD Report No. 1297, See also Department of Commerce PB L87760; 29 December 1942. ABSTRACT: This short report summarizes the study undertaken to understand the operation of spaced dipole antenna direction finders (elevated H). (a-3, b-3, c-1, d-1, e-0, f-Study)

1579. MIDGETT, A. H., "Calculated Bearings," Signal Corps, Engineering Laboratory, Draft (Coles: D/F Group); 30 December 1942. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1943

1580. ANONYMOUS, "Coastal Refraction," Baddow Research Laboratories, Marconi, Chelmsford, England, Report No. TR.436; 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1581. ANONYMOUS, "DAJ Direction Finder," U. S. Coast Guard; ca 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1582. ANONYMOUS, "Development of V.H.F. D.F. Equipment," Mullard Radio Valve, Limited (British) Report No. R.D. 424; 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1583. ANONYMOUS, "Instruction Sheets for Foreign Equipment," (German:O.K.H.); 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1584. ANONYMOUS, "Japanese Direction Finder, Type 94, Model No. 1," Signal Corps Engineering Laboratory, Coles: Capt. E. E., Report No. 4. See also Department of Commerce PB1511; 1943. ABSTRACT: The captured equipment is a loop direction finder covering the frequency range of 100-2000 kc. The Receiver, when connected to a suitable antenna, is apparently used for intercept purposes. Photographs accompany this report. (a-4, b-3, c-1, d-1, e-845, f-Enemy equipment)

1585. ANONYMOUS, "The Telefunken Direction Finder and Its Application to Sea Travel," (German:Telefunken) See: Air Document Index No. R2100 F691; 1943. ABSTRACT: Not available. (a-4, b-3, c-4, D-4

1586. ANONYMOUS, "Theory of the DAB Direction Finder," U. S. Coast Guard; ca 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1587. ANONYMOUS, "Very Short Wave Interference and D. F.," Baddow Research Laboratories, Marconi, Chelmsford, (British) Report No. TR.438; 1943. ABSTRACT: Not available (a-4, b-3, c-1, d-5, e-0, f-0)

1588. ANONYMOUS, "Yearbook, 1942/1943," (German:D.A.L.) See: Department of Commerce PB25249; 1943. ABSTRACT: This yearbook was published by the German Academy of Aeronautic Research and contains introductory material by various German scientists and industrialists connected with German aviation. It presents also an annual report by the chancellor of the academy and biographies of well known German members of the academy. It furthermore contains a bibliography of literature connected with aviation and which was published in previous years. The scientific part of this yearbook is composed of lectures given by members of the academy during scientific sessions of the session period 1942/1943. The following problems were discussed and are presented in the yearbook in the form of abstracts: (1)Ferromagnetism and materials, by Eduard Houdremont. (2) The effect of shocks on the magnetic conditions of ferromagnetic bodies; the magnetic condition of vehicles, by Heinrich Lange. (3) A 3-dimensional direction finding reflection appartus, by Wilhelm Runge. (4) On the direction finding ability/of continuous wave transmitters, by A Esau. (5) Remarks on the method of direction finding with continuous wave transmitters, by Erwin Roessler. (6) Experimental study and explanation of the declination of short wave adcocks during reception of

a transmitter lying in the skip distance and further distance, by Max Dieckmann. (7) Remarks on the military use of continuous wave transmitters, by P.V. Handel. (8) ....(a-3, b-1, c-4, d-4, e-0, f-Yearbook)

1589. BERGTOLD, F., "A Direction Finding Antenna Sunk below the Surface of the Ground," Hochf: tech. u. Elek: akus, vol. 61, p. 91; 1943. ABSTRACT: Not available. (a-4, b-1, c-1, d-4, e-0, f-0)

1590. BEUERMANN, W., "Target-Flight Direction Finder with Automatic Indication," Hochf: tech. u. Elek: akus, vol. 66, p. 67; 1943. See also Wireless Engineer, vol. 21, p. 41; 1944. ABSTRACT: An extension of the homing beacon system with swinging directional characteristics to short waves, using Adcock antennas. (a-6, b-1, c-4, d-4, e-0, f-Description)

1591. GOLDSTEIN, M. K., "A Phase Type Indicating Direction Finder," USN, BuShips 925D; D-33.5-135; 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-134, f-0)

1592. GREEN, A. L., AND WALTON, J. G., "Aircraft Radio Compass and Communication Receivers," A.W.A. tech - Review, vol. 6, pp. 1735; 1943. ABSTRACT: The equipment comprises a complete receiver, ranges 275 - 1700 kc/s, 2.3 - 3.3 Mc/s and 6 - 7 Mc/s, with facilities for both aural and visual indications of homing and direction-finding in the band 275 - 1700 kc/s. The set is a 7-valve, 5-band receiver with 4 additional valves switched into circuit for compass operation. Complete remote control of both communication and compass facilities is provided. An explanation of the operation of the equipment is given. This involves the conception of the loop system as a suppressed-carrier modulator with the carrier being re-supplied at a later stage by the fixed aerial. The theory leads to the prediction and to the achievement of better performance of the radio compass, particularly with resp. to sharpness of bearing and elimination of overload of the left-right visual indicator. (a-3, b-1, c-1, d-11, e-0, f-Description: Note - Science Abstracts dates publication in 1942)

1593. HASSELBECK, W., "Direction-Finding System Using a Capacitive Goniometer and a Cathode Ray Oscilloscope," Hochf: tech. u. Elek: akus, vol. 60, p. 148; 1943. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1594. JOHNSKE, F., AND REBMANN, H., "Direction-Finding with Figure-of-Eight Diagram and Automatic Extinction of False Minimum," Hochf: tech. u. Elek: akus, vol. 60, p. 27; 1943. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1595. JONES, D. D., "Flux Navigator," Electronics, vol. 16, p. 74; 1943. ABSTRACT: In restricted waters, the magnetic field surrounding a loaded submarine power cable may be used very effectively as an aid to navigation. This fact is of particular importance in places where there is occasional heavy fog and water traffic must be maintained. Recently, one of the largest broadcast transmitters in the United States was erected on a small island in a region which, at intervals during certain months of the year, becomes totally obscured in dense fogs of long duration. For efficient operation in all weather, a transmitter so located requires regular and dependable ferry service. Primary power is supplied to this island by means of two heavily armored polyphase submarine cables, only one of which is loaded at any time. Since the route used in laying the cables is approximately coincident with the course charted for the ferry, a sound practical basis was established for development of the "flux navigator." Each power cable is routed in a separate channel leading to the island and each channel is sufficiently deep at mean low water to permit small boat navigation with safety. The flux of the magnetic field surrounding the loaded cable generates an emf in the loop circuit of the flux navigator. This energy, a large component of which is 180 cycles, is then amplified, rectified, and impressed across the terminals of an indicating meter. In effect, this device is like a flux meter except that it is designed for use in very weak fields, provides an audible signal when and if needed in emergencies and, being mechanically rugged, is well adapted to navigational purposes. Experimental runs have demonstrated this method to be simple, reliable, and surprisingly accurate. On some of the first experimental tests, it was found advisable to locate and trace each submarine cable from the island to the splice point on the mainland. The information so obtained has been prepared in map form and is available for future reference. The elements of a single loop system are now being used in the permanent equipment on board the boat including an RCA type 62-A portable amplifier which has a voltage gain of 86 decibels. With the single loop system, the gain through the amplifier is adjusted so that "On Course" is indicated by maximum deflection of the pointer. The voltage gain required for either cable was determined by experiment. Gain adjustments are not critical and, in general, depend upon the topography of the ocean floor which naturally determines the spacing between the loaded cable and pickup coil. The magnetic field intensity (H) varies directly with current and is inversely proportional to distance, so that as the boat approaches the cable from any angle the field intensity at the loop increases and there is a very marked increase in meter deflection as the boat gets within a few feet of the cable. For the greater part of the total length, the cables supplying power lie at a depth of 15 to 30 feet and, in one section, the cable used for emergency supply lies at a depth of 50 feet at mean high water. It becomes evident that the sharpness of indication at M for a given cable current will depend upon the depth of the water at any point. Since readings on the meter show field intensity (H) only, there is, of course, the exceptional possibility of making a 180 degree error. The lack of port and starboard indication is no serious disadvantage, however, because the meter pointer can deflect to maximum only when directly over the cable and the boat is steered for maximum deflection with perhaps a continuous slight weaving along the course. (a-1, b-2, c-1, d-1, e-0, f-Description)

1596. JORDANOFF, A., "Glossary of Terms Used in Telecommunications," British Standards Institution; 1943. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-Terminology glossary)

1597. JORDANOFF, A., Through the Overcast, New York: Funk & Wagnalls Company; 1943. ABSTRACT: The book deals primarily with weather and instrument flying. It is intended as a reference for the private pilot. D/F techniques as required for position plotting and homing are also discussed in laymen's language. (a-4, b-6, c-1, d-1, e-0, f-Book)

1598. KORNETZKI, M., "Direction-Finding Loop Antenna for Aircraft with Decreased Dimensions," V.D.I.Z., vol. 87, p. 188; 1943. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Description)

1599. LEA, N., "The Calibration and Correction of Naval Direction Finders," Marconi Rev., no. 16, p. 18; ca 1943. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-RDF Error)

1600. LORENZ, C., "Development and Test of the 'Komet' Air Navigation Method to be Carried Out in Cooperation with the DVL," (German) See: Department of Commerce PB L85365; 1943. ABSTRACT: Description and justification of the "Komet" antenna system. Results of tests performed with equipment established in the Gaeta-Palermo region. Diagrams and graphs are included. (a-3, b-3, c-4, d-4, e-0, f-Report)

1601. MCINTOSH, C. H., "Instrument Approach by Radio Direction-Finding," Aviation, vol. 42, pp. 206-224; 1943. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

1602. METZ, H. I., "The CAA-RCTA Instrument Landing System. Part I. Development and Installation," C.A.A.T.D. Report No. 35; 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instrument landing system)

1603. METZ, H. I., "The CAA-RCTA Instrument Landing System. Part II. Tests and Modifications," C.A.A.T.D. Report No. 36; 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instrument landing systems)

1604. RUNGE, W., "Some Telefunken Patents in Direction Finding Technique," Hochf: tech. u. Elek: akus, vol. 60, p. 58; 1943. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-Patent descriptions)

1605. TERMAN, F. E., Radio Engineers' Handbook, New York, McGraw-Hill Book Company, Incorporated; 1943. ABSTRACT: The purpose of the "Radio Engineers' Handbook" is to provide a reference book summarizing the body of engineering knowledge that is the basis of radio and electronics. Particular effort has been made to achieve thoroughness and the following index listings to direction-finding are noted: Direction Finders, Automatic, 891; cathode-ray, 884-886; instantaneous, 884-886; loop, 875-880; compensated loop, 888; pulse,

888; rotating beacon, 887; spaced-loop, 886; Direction Finding, 872-891; errors in D/F, 872-875, 879; errors from polarization, 877; Direction of Radio Waves, deviation in, 831; Direction-Finding Systems, standard wave error of, 883. (a-1 & 4, b-6, c-1, d-1, e-0, f-Reference book)

1606. WEBER, R., "Automatic Direction-Finding," Hochf: tech. u. Elek: akus, vol. 60, p. 32; 1943. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

1607. ANONYMOUS, "Radio Direction-Finding Station 40g, Mobile," (German) See: Air Document Index No. R2150 F869; January 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1608. ANONYMOUS, "Report on Triangulation Tests Conducted with the New York, Pittsburgh, and Washington Direction Finders," Civil Aeronautics Administration, Technical Development Division; January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1609. ANONYMOUS, "Summary of Interaction Effects," Admiralty Signal Establishment (British) Report No. BW TR/458; January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1610. ANONYMOUS, "Transportable VHF DF Equipment," Royal Air Force (British), Air Publication No. 2522; January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1611. GROSSKOPF, J., "Process to Eliminate Quadrantal Error in Aircraft Direction Finders," (German: F. D. R.) See: Air Document Index No. R2770 F239; January 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-1, f-Instructions)

1612. GROSSKOPF, J., AND VOGT, K., "Tests on Night-Effect-Free DF'ing in the Vicinity of Reflectors," (German) See: FIAT 677 Report No. 249; January 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Test report)

1613. POLLACK, H., "An Analysis of the Bellini-Tosi Fixed Direction Finder," Communications, vol. 23, pp. 33-34, 51; January 1943. ABSTRACT: An elementary article describing the principles of operation of the Bellini-Tosi system. (a-4, b-1, c-1, d-1, e-0, f-Description)

1614. PRICE, E. T., "Presidential Address Developments in D-F," Trans. S. African Inst. Elect. Engrs., vol. 34, pp. 17-21; January 1943. ABSTRACT: Important developments in the manufacture of D/F apparatus in South Africa is discussed. Paper is abridged to meet censorship requirements. (a-6, b-1, c-1, d-14, e-0, f-Survey --abridged)

1615. SCHELKUNOFF, S. A., "A Mathematical Theory of Linear Arrays," Bell System tech. J., vol. 22, no. 1, pp. 80-107; January 1943. ABSTRACT: A mathematical theory, suitable for appraising and controlling directive properties of linear antenna arrays, can be based upon a simple modification of the usual expression for the radiation intensity of a system of radiating sources. The first step in this modification is closely analogous to the passage from the representation of instantaneous values of harmonically varying quantities by real numbers to a symbolic representation of these quantities by complex numbers. The second step consists in a substitution which identifies the radiation intensity with the norm of a polynomial in a complex variable. The complex variable itself represents a typical direction in space. This mathematical device permits tapping the resources of algebra and leads to a pictorial representation of the radiation intensity. An antenna array is a spatial distribution of antennas in which the individual antennas are geometrically identical, similarly oriented, and energized at similarly situated points. The first and the last properties insure that the form of the current distribution is the same in all the elements of the array and that consequently the array is composed of antennas with the same radiation patterns. The difference between individual elements consists merely in the relative phases and intensities of their radiation fields. The second property means that the radiation patterns of the individual elements are similarly oriented and that consequently the radiation pattern of the array is the product of the radiation patterns of its typical element and the "space factor." The space factor of an array is defined as the radiation pattern of a similar array of non-directive elements. Hence in studying the effect of spatial arrangement of antennas, we may confine ourselves to non-directive elements and thus materially simplify the analysis. An array is linear if points, similarly situated on the elements, are colinear. In this paper we are concerned mostly with linear arrays of equispaced sources although in conclusion we shall have an occasion to say a few words about more general types. (a-1, b-1, c-1, d-1, e-0, f-Theory)

1616. TOVAR, "Radio Direction Finder, G 6 Installation for the ME 110," (German) See: Department of Commerce PB56480, January 1943. ABSTRACT: A short report on the installation of a radio direction finder in the Me 110, using a compensating antenna made of aluminum or dural wiring. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Enemy equipment)

1617. TUKADA, T., "A Cathode Ray Goniometer - Direction Finding," (German) See: Department of Commerce PB54671; January 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1618. ROSS, W., AND TAYLOR, H. W., "Some Short-Wave Bearing Observations Made with a Spaced Loop Direction Finder. January - August 1942," National Physical Laboratory (British) Report No. RRB/C.46; 1 January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1619. JANSKY, K. G., "Direction Finding on the Initial Part of a Radio Telegraph Signal," Bell Telephone Laboratory internal report: Memo No. 43-160-3; 4 January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1620. LENT, W. C., "Report on Survey of Direction Finder Development Activities in the United States," Technical Report published by DF Section 13.1 of the Communications Divisional, National Defense Research Committee; 8 January 1943. ABSTRACT: This report, declassified in August 1960, is a review of direction finding activities during the two-year period prior to the date of publication. A series of projects are reviewed including: (1) A development by Hazeltine Corporation on a UHF direction finder for the location of friendly aircraft in the range of 100 to 250 mc in two bands. The system provided for automatic indication of bearing and had arrangements for remote azimuth display. (2) Bell Telephone Laboratories and Western Electric developed a high frequency direction finder. Consideration was given to both phase and amplitude comparison methods. It was concluded that phase comparison methods would involve complicated equipment and would require too much time for development. Initial amplitude comparison attention was given to loop antennas and an elevated H Adcock. Limitations of these systems were considered prohibitive, and they were discarded in favor of a fixed system of crossed Adcock antennas with buried cross connections. The system which evolved used low impedance arrangements in the range of 5 to 15 mc. The voltage from each was fed through a high gain receiver with each output fed separately to vertical and horizontal planes of a cathode ray tube; that is, a twin channel receiver. Details of this research are contained in final reports for OSR Projects OSRD 209 and OSRD 699. Assistance was given to the Army Signal Corps in the development of a similar receiver. (3) Under NDRC Contract NDCrc-149, RCA undertook an HF D/F research project in which all known suitable types of pickup systems were theoretically investigated. It was concluded that no pickup system was free of all types of error but that a shielded U Adcock offered the greatest promise in the 2- to 30-mc range. The research also considered a suitable artificial ground system and measurements of wanted and unwanted pickup of various conditions of azimuth elevation, polarization, and frequency of the arriving signals with several ground plane and counterpoise geometries. Efforts were made to produce portable equipment. The conclusion was reached that a shielded U Adcock employing an elevated artificial ground plane can be made portable and still have high accuracies in sky wave direction finding. This research is summarized in final reports OSRD-211 and OSRD-337. (4) Under NDRC Project C-18, the National Bureau of Standards undertook a high frequency D/F research project designed to evaluate mathematically the nature of field components in a direction finder so as to evolve an exact measuring technique. Detailed analyses of various target transmitter arrangements were made. Detailed consideration was given to characteristics of waves reflected from the ionosphere and suitable operations for the direction finder at a point in space where developed. This research also included the testing of various direction finders including the Navy type DY, the Signal Corps type SCR-551, the WE-CAA, the United Air Lines spaced vertical loop equipment, the same equipment with the loops rotated to

a coplanar horizontal position, and the Collins CXAL spaced vertical loop direction finder, more commonly known as the Navy DAB. The details of this work are contained in the final report OSRD-964 on Project C-18. (5) Under NDRC contract NDC rc-159 Stanford University made an investigation of methods of compensation in direction finders to minimize or eliminate polarization error. This was the compensated loop research performed by Terman and Pettit which concluded that the method of compensation developed could be used at any frequency, that it should be possible to design a balancing network which will vary properly with frequency, and that the system would work effectively at small heights above ground. The details of this research are summarized in final report OSRD-508. However, in later years this material was published in the Proceedings of the IRE (Terman and Pettit). (6) Under NDRC contract OENsr-310 Bell Telephone Laboratories in cooperation with Western Electric Company studied the possibility of pulse type instrumentation for direction finding purposes on high frequency. The Holmdel Musa equipment was used to study the pulses of 100 microseconds duration on the frequencies of 17.310, 7.175, and 6.425 kilocycles. This result indicated that pulse type transmissions offer a reduction in error since improved bearings were obtained on the first pulse received. The details of this research are contained in final report OSRD-599. Receiver bandwidths were not stated. (7) Under NDRC contract OENmr-338, RCA conducted studies on high angle signals with captive balloon equipment. The measuring technique was applied to the Bell Telephone buried U Adcock at Holmdel. At standard frequencies, large wave errors were observed. It was observed that a minimum of unwanted response was obtained in the Holmdel system which could not be correlated in a manner clearly understood. This research is contained in final report OSRD-908. (8) The Naval Research Laboratory completed a study of site factors to determine criteria for site selection. (9) An exhaustive study by the Naval Research Laboratory for wide band coupling systems was completed. (10) A local modulation system was developed providing discrimination against undesired response in the pickup system. This system provides automatic sense in conjunction with a cathode ray indicator. In addition to these ten items, the report also reviews developments of specific direction finders including the SCR-206, a rotating loop for .2 to 18 mc; the SCR-255, an H Adcock system designed for the range of .54 to 30 mc similar to the Navy DY; the SCR-503 which was a crossed loop twin channel equipment for the range of .1 to 3 mc; the SCR-504 which was an extremely portable single loop equipment for the range of .1 to 60 mc; the SCR-551 which was an elevated H Adcock with cathode ray indicator for semiportable use on a 15-foot mast to cover the range of 2 to 8 mc and later 2 to 20 mc; SCR-555 which was a high frequency elevated H Adcock for the range of 18 to 55 mc; SCR-556 which was similar to the previous covering 65 to 140 mc; SCR-291 which was a modification of 502 developed by Federal Telephone and covering the range of 2 to 10 mc; the SCR-292 which is a modification of the Adcock array rotating spaced loop direction finder employing a tunable receiver in the range of 2 to 18 mc. The report also describes other direction finders which were at that time in process of being tested, including the SCR-502 which was a portable system using monopoles in the 1.5- to 30-mc range; the SCR-501 which was a buried U Adcock operating from 5 to 15 mc and later to 30 mc; the DK and DL direction finders which were rotatable loop aural null equipments with the range of .1 to 1 mc; the DM and DO direction finders which were portable type rotatable loop aural null equipments for the range of .1 to 1.5 mc for shipboard use; the DP and DQ direction finders which were rotatable loop aural null equipments for the range of .1 to 1.5 mc for shipboard use; the DR which was a portable field equipment of the rotatable loop type in .2 to 8 mc; the DT and DY rotatable elevated H Adcock for 2 to 30 mc. More modern equipments were also listed including the DAB, a spaced loop for the range of 2 to 18 mc. The comment was made that this equipment achieved a marked increase in sensitivity by tuning the individual loops; the DAW, a semiportable rotatable loop designed for .25 to 1.8 mc; the DAF, a semiportable rotatable loop for the range of 80 kc to 3.0 mc; the DAG, an extremely portable battery operated rotatable loop for the range of 1.5 to 18 mc; the DAH, an Adcock consisting of four 100-foot masts on a 40-foot diameter counterpoise; the DAK, a fixed crossed loop with goniometer for shipboard use; the DAJ, a fixed shore station using four monopoles for the range of 15 to 30 with cathode follower coupling; DAL, DAM, DAN, DAO Adcocks which were subsystems of the DAJ; the DAP which was a semiportable rotatable loop using aural null in the range of 250 to 550 kc; the DAQ which was a shipboard crossed loop and goniometer for the range of 1.5 to 20 mc and the DAR, a U.S. Navy modification of the British FH-3 which uses crossed loops and a manual goniometer in the range of 1 to 20 mc. Also described is a Caltech development of a UHF direction finder. A Federal Telephone and Radio transportable equipment designated SCR-502, similar to the DAJ, is described. Spacing errors in the shore Adcocks were generally reduced by providing two sets of antennas for the range of 1.5 to 30 mc. Other RCA work on portable Adcocks is described. A Federal telephone study of direction finder fundamentals is described including polarization study, a wide band crossed loop D/F development, a study of spaced crossed loop antennas, experimental comparison of the electronic and mechanical components of sky wave, and other miscellaneous items. Other miscellaneous Federal Telephone research work is described. A series of modifications to existing equipments by Federal Telephone is described. Collins Radio research on a new technique for wave error measurements at large elevation angles is described. A Collins Radio research project using three pairs of vertical arrangements in an attempt to reduce diversity effects and error is described. Naval Research Laboratory work on propagation phenomena is described. NRL research on the effects of ships hull and superstructures is described. Army Signal Corps Laboratories had work in progress including a spaced loop direction finder for the 2- to 8-mc range, for the modifications to the SCR-551, and an electronic goniometer. The Army work also included a fixed station direction finder for 5 to 30 mc, and a small spaced loop direction finder covering the range from 5 to 20 mc suitable for use in a vehicle. Also described are loop type D/F's including the SCR-558, a 3 to 18 mc; SCR-503; and direction finders for meteorological balloon tracking. Certain projects contemplated at that time are described, and controversial technical questions are listed which included measurement of direction finder performance on the ground, artificial ground planes, loop effects in Adcocks, lateral deviation effects, and certain other points. Conclusions and recommendations are made relative to the material presented. (a-4, b-3, c-1, d-1, e-157, f-Short review)

1621. McCOY, R. E., "Field and Laboratory Tests of Radio Set SCR-503-T2 (Direction Finder Frequency Range 100 Kc. to 3 Mc.," Signal Corps Engineering Laboratory, Eatontown, ESL Report No. 1 (Coles: D/F Group); 10 January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1622. ANONYMOUS, "Direction Finding Antenna Study," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 163; 19 January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1623. NOBILE, G., "A Direction Finder for Atmospherics," Bull. Assoc. Suisse Elect., vol. 34, pp. 43-46; 27 January 1943. ABSTRACT: An apparatus which is designed to record the direction of atmospheric disturbances caused by lightning discharges is described. This device, which is in the service of the Swiss Meteorological Office, permits the registration of storms as remote as the Atlantic coast of America with an accuracy of 1° even if heavy storms occur simultaneously in the neighbourhood of the recording station. (a-3, b-1, c-3, d-Switz., e-0, f-Description)

1624. WIRKLER, W. H., "A Study of Present Development Work and Future Development Programs," Collins Radio Company, Cedar Rapids, Iowa, Report CER 112; 30 January 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Work outline study)

1625. ANONYMOUS, "Instruction Book for Navy Model DAP, Radio Direction Finder Equipment," US Navy, Bureau of Ships. See Department of Commerce PB17886; February 1943. ABSTRACT: The model DAP radio direction finder is designed for use on small naval craft of wooden construction. It is suitable and capable of taking accurate bearings of radio signals with either A1, A2, or A3 emission characteristics. It has a frequency range of 290-550 kc, and consists of two major units: (a) Receiver and (b) Vibrator power unit. This manual gives instructions for installing, operating, and maintaining the equipment. Parts list, photographs, and diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1626. ANONYMOUS, "Radio Navigation Equipment FuG 141 Technical Manual," (German: RML) See: Air Document Index No. R Sp 3 F: February 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Tech. manual)

1627. CRAMPTON, C., WHIPPLE, R. T. P., AND TOCZYLOWSKI, H. S., "H/F D/F Afloat. The Vertical Polar Diagrams of Radiation of the Main Transmitter Aerial in Typical U-Boat," Admiralty Signal Establishment (British) Report No. M.492; February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1628. HASSELBECK, W., AND STEIN, F., "Arrangement for Generating a Minimum Clearing Voltage in a Direction Finder," Hochf: tech. u. Elek: akus., vol. 61, p. 64; February 1943. See also Wireless Engr., vol. 20, p. 619; December 1943. ABSTRACT: An

auxiliary coil is mounted at 90° to the search coil: its voltage, displaced by 90° is taken to circuits, which continually vary its amplitude and suddenly change its phase by 180°, and is then led to the receiving system to act as a null-clearing voltage. (a-1, b-1, c-4, d-4, e-0, f-Patent description)

1629. LEVY, G. F., "Loop Antennas for Aircraft," Proc. IRE, vol. 31, pp. 56-66; February 1943. ABSTRACT NO. 1: In this paper, characteristics, requirements, and design considerations which are associated uniquely with aircraft antennas operating in the radio range or beacon band extending from 200 to 400 kilocycles are discussed. Low-impedance and high-impedance types of air-core aircraft loops are considered in detail. Actual polar-characteristic curves are given for a number of loop antennas of both types. Iron-core loop antennas are considered separately and comparison is made with the more widely used air-core types. (Correction in Proc. IRE, vol. 31, p. 384; 1943.) ABSTRACT NO. 2: High- and low-impedance loop aerials with their receiver input circuits are analysed: the low-impedance type is generally preferable for aircraft. Polar-diagram errors are dealt with for solenoid- and pan-cake-type windings and examples given of the improvement of min by es shields either of the tube- or dome-shaped type. Quadrantal errors remain, which may be of the order of 7° - 15°. Input sensitivities of the 2 types of winding are compared, and it is shown that the pancake type gives greatest resultant voltage. Iron-cored loop aerials are considered; these, if properly designed, may be expected to give greater efficiency than the open-core type. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Theoretical analysis)

1630. LUKE CHIA-LIU YUAN, "Ultra High Frequency Radio-Sonde Direction Finder," Office of Scientific Research and Development Report No. 1256. See also Department of Commerce PBL 87766; February 1943. ABSTRACT: A simple radio direction finder for observing the flight of metereological balloons is described. An Adcock antenna and a single dipole antenna system, including a corner-type reflector as shield against ground reflected waves, were used for measuring the azimuthal and the elevation angles, respectively, of the direction of an incoming electromagnetic wave emitted from a transmitter sent aloft on meteorological balloons. A description of a corner type collector which was sent to effectively shield the antenna used for elevation angle measurement is given and various curves are represented to show its shielding characteristics at varying wire spacings, focal lengths, and wire lengths. Using the direction finder an accuracy of 1/4° in the determination of the azimuthal angles at various vertical inclinations is obtained. While in the determination of the elevation angles when using a stationery transmitter as target which was set up on top of Mt. Wilson at a distance of seven miles away, an accuracy of within 1/2° is easily obtained. When the target transmitter is sent aloft on meteorological balloons the air from the elevation angles observations range from zero to few degrees. The errors in the elevation measurements were probably caused by the swinging and rotation of the transmitter and transmitting antenna during flights, the deterioration in the efficiency of the shielding response of the corner reflector due to surface oxidation of the reflector wires under long weather exposures. Goldplating of the reflector wires shows a marked improvement in the shielding efficiency of the reflector system. At the request of the NDRC the direction finder was sent to Signal Corps Laboratories at Ft. Monmouth for further testing. A brief description of the preliminary tests made at Ft. Monmouth is also given. Performed under Contract OEMsr-217 at California Institute of Technology, Pasadena, California. (a-3- b-3, c-1, d-1, e-0, f-description)

1631. PETERS, R. G., "Automatic Aircraft-Radio Recorder," Communications, vol. 23, pp. 11-14/72 and 44, 46, 49, and 77; February and March 1943. ABSTRACT: A technique for transmitting instantaneously to the ground, test flight data referring to 70 different points in a plane. The transmitter on the aircraft is frequency-modulated in succession by each of the instruments concerned, and the signal received is recorded on a disc and also analysed automatically into its separate components. The whole series of instruments is "scanned" 100 times per sec, so that an almost continuous record is obtained of each. For transmission, each instrument reading is converted into a frequency in the range 0-5000 c/s, and these are used to modulate the transmitter: effects of varying signal strength are thus minimized. Ranges up to 100 miles can be covered, and the system records vital data should a crash occur. (a-3, b-1, c-1, d-1, e-0, f-Description)

1632. JARVIS AND MUMFORD, "Preliminary Field Trial of a C. R. D. F. Course Indicator," General Post Office (British) Report No. 858; 4 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Test)

1633. ANONYMOUS, "A Proposed System for Estimating the Probable Accuracy of a Bearing Observation," National Physical Laboratory (British) Report No. WO. NPL. 7; 8 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Proposal)

1634. ANONYMOUS, "Radio - Corporation Contract NXs-4522 - Model DAP Direction Finder - Garod Radio Corporation, Brooklyn, New York, Contractor - First Production Equipment - Test of," USN NRL Letter No. C-S67/69(342); 8 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1635. YUAN, K., "Ultra-High-Frequency Radio-Sonde Direction Finding," California Institute of Technology, Pasadena, California, Project No. C 1-33; 8 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1636. ANONYMOUS, "Investigation of Direction Finding Errors Due to Site Characteristics. Study of Reduction of These Errors: Methods of Calibration," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 166; 12 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1637. ANONYMOUS, "Model DZ-2 Aircraft Radio Direction Finder Equipment. Frequency Range 15 - 70 KC and 100 - 1750 KC, 24V, D. C. Operation," US Navy, Bureau of Ships. See Department of Commerce PB14818; 13 February 1943. ABSTRACT: This equipment consists essentially of a rotatable loop antenna, a radio receiver, and a dynamotor-filter. It was designed for installation in all types of naval heavier-than-air aircraft whose space limitations are such as to permit access for operation of the receiver and loop controls. The equipment may be used either for direction finding or for radio reception in the range from 15 to 1750 kc. The handbook has complete sections on installation, operation, maintenance, and description of the equipment. Parts lists for all components are provided as well as tables of typical meter readings obtained on all parts of the direction finder. Photographs, drawings of parts, and schematic and wiring diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1638. LUCK, D. G. C., "Proposal for the Testing of Direction Finder Performance," Radio Corporation of America, Camden, New Jersey; 15 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1639. BARFIELD, R. H., "The Selection of Sites for Spaced Vertical Aerial Direction Finders Operating on Wave Lengths of 20 - 3000 Metres (Frequencies 100 to 15,000 Kc/s)," National Physical Laboratory (British) Report No. RRB/c. 67; 16 February 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

1640. ANONYMOUS, "Calibration of Direction Finding Stations," Royal Australian Air Force, Headquarters, Melbourne, Report No. S. C. I. A. S. D. 034, No. S 1/D. F. 2; March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-11, e-0, f-Calibration)

1641. ANONYMOUS, "Problems in Theory and Technique of Antennas: Part I," (German) See: Department of Commerce PB 119640; March 1943. ABSTRACT: Collection of 19 reports prepared by the Generalbevollmächtigten für Technische Nachrichtenmittel for presentation at the Vierjahresplan Institut für Schwingungsforschung, Mar 24-26, 1943. For Part II see PB89013. ABSTRACT: Contents: I: General requirements on the qualities and dimensions of movable and fixed antennas, by R. Appel. - II. Ship transmission antenna installations with nongrounded antenna part and requirements of the navy as to shipboard antenna installations, by H. Schlicke, - III. Directional antenna systems with antenna amplifiers, by H. Rindfleisch, - IV. Requirements of the airforce of dm antennas for directional connections, by H. Dahlmann, - V. Aircraft antennas, by H. Netherler, - VI. Surface excitation, by S. Zisler, - VII. Ultra short wave aircraft antennas, by W. Kloepfer, - VIII. Long wire antennas on airplane wings, by G. Goubau, - IX. Antenna and range, by K. Franes, - X. Principles of directional antennas, by W. Moser, - XI. New ultra short wave directional antenna with purely vertical polarization, by R. M. Wundt, - XII. Directional antenna system for dm- and cm-waves without energy cable to the instrument, by K. Laemmchen, - XIII. Ground direction-finding antenna systems, by W. Hasselbeck, - XIV. Direction finding loop with iron core, by A. Weis, - XV. On multiple utilization of transmitter antennas, by H. Brueckmann, - XVI. On anti-fading

antennas, by H. Brueckmann, - XVII. Antennas on railroad cars, by A. Kraus, - XVIII. Raw material problems with antennas from the point of view of radio engineering, by W. Hahn, - XIX. Directions for the uniform designation of antenna magnitudes in lectures and reports. AF T-2 T/2222. ZWB FB 339/44. (a-3, b-3, c-1 & 4, d-4, e-0, f-Technical reports)

1642. BUSIGNIES, H., ET AL., "WWV Transmission Observed at Federal Telephone and Radio Corp. Laboratory, Great River, Long Island, Bearing Polarization Ratio of Vertical to Horizontal Field Strength. Interim Report," Office of Scientific Research and Development (OSRD) Report No. 1344. See also Department of Commerce PDL87753; March 1943. ABSTRACT. This report, purely descriptive, indicates what results have been observed and includes: (1) Equipment description, (2) Methods of testing the outlined equipment, (3) Correction scale for use with the tape recordings, (4) The master graph, and (5) Detailed reports of observations. Photographs and graphs are attached. (a-3, b-3, c-1, d-1, e-0, f-Description)

1643. GRIFFITH, R. M., AND ROSINSKI, W., "D/F Trials in H.M.S. Activity, 100 - 124 Mc/s," Admiralty Signal Establishment (British) Report No. M.503; March 1943 ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Test)

1644. LUCK, D. G. C., "The Measurement of Errors of Radio Direction Finders. Final Report," Office of Scientific Research and Development (OSRD) Report No. 1653. See also Department of Commerce PBL87771, March 1943. ABSTRACT: Determination of technical performance of radio direction finders is very important to the user; the problem it presents is analyzed and discussed. Some errors of direction finding are properties of radio signals rather than of apparatus and must be avoided in performance testing. Other errors are strictly internal properties of the apparatus and can be determined in the laboratory. The remaining errors arise in the interaction of signal and apparatus. Some of them, such as multipath wave-interference errors and errors due to nearby objects are very important but so complex that testing conditions cannot yet be specified. Errors occurring on signals arriving over a single path at a direction finder in clear surroundings can be measured as functions of frequency, polarization, azimuth and elevation of arriving signal. Such measurements require a fully controlled test signal directly simulating typical actual signals provision of this test signal is the object of this project. The testing instrument is a signal field, made complex by the presence of the ground. Its properties are shown analytically and some of them are discussed. The field of a local source differs from that of a distant signal, so testing is simplified by using distances of at least a few tens of wave-lengths. Direction-finder responses to favorably and unfavorably polarized signals may be measured separately and operating errors may be inferred from the results. This method, used in our field work, requires a signal source of very pure polarization. A light, self-contained source built to conform to the shape of a simple electric or magnetic dipole is described. It has been found to have sufficiently pure polarization for some but not all direction-finder testing. A new method of testing is proposed which would employ both favorably and unfavorably polarized signals simultaneously, with continuously varying relative phase. A generator for such a test field is described. The new method would be quick, direct, simple, and reliable to use. An aircraft is required to support the transmitter used for direction-finder testing; a tall tower is a very useful auxiliary support. While a dirigible is the ideal supporting craft, a captive balloon is a useful substitute under proper conditions. Performance-testing sites must be most critically chosen for clearness and homogeneity over a very large area and to a sufficient depth. Salt-marsh sites are required to determine ultimate direction-finder performance capability; desert sites are also required to determine possible impairment of ultimate performance. Extension of measurements of the sort described to include multipath and nearby-obstruction errors can be made whenever specification of suitable measuring conditions becomes feasible. Work done under contract OEMsr-838 at RCA Laboratories, Princeton, N. J. (a-3, b-3, c-1, d-1, e-o, f-Study report)

1645. TROOST, A., AND SCHULTZ, G., "Adcock Antenna System," Hochf:tech. u. Elek:akus, vol. 61, pp. 90-91; March 1943. See also Wireless Engineer, vol. 20, p. 561; November 1943. ABSTRACT: The electrical lengths of the aerials and their connecting lines are so chosen that the even natural wave-lengths (open and resonance) of the system falls about in the middle of the working band, and the uneven natural wave-lengths on either side of it (closed-end resonance) are outside that band. Moreover, the input impedance of the D/F receiver is chosen small compared with the aerial impedance at the middle of the band. (a-6, b-8, c-4, d-4, e-0, f-Patent description)

1646. ADCOCK, F., AND FORD, L. H., "Radio Direction Finding on Wavelengths of 50 - 100 Cm. Frequencies 300 - [illegible] Mc/s. Part I. - The Development of and Use of a Rotating Spaced Aerial (H) Direction Finder. Part II - On the Use of a Reflector with a Rotating H Aerial System," National Physical Laboratory (British) Report No. RRB/c.70; 1 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Survey and instructions)

1647. GRUNBERG, G. A., "Suggestions for a Theory of the Coastal Refraction," Phys. Rev., vol. 63, pp. 185-189; 1 March 1943. ABSTRACT: An approximate method of attacking the problem of the refraction of electromagnetic waves when passing from sea to shore is based on the fact that an electromagnetic field varying with time can penetrate only slightly into a sufficiently good conductor. It is thus possible to formulate an approximate boundary condition at the surface of separation of 2 media of greatly differing conductivity. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

1648. PRESSEY, B. G., "The Measurement of Errors in Radio-goniometer at High Frequency and Very-High Frequency," National Physical Laboratory (British) Report No. RRP/c.68; 5 March 1943. ABSTRACT: The various sources of error in goniometers of the inductive type are classified and discussed. A review of existing methods of measurement of these errors is followed by detailed descriptions of three methods which have been used in the high and very high frequency bands (3-100Mc/s) at the National Physical Laboratory. The first is a field coil interconnection method in which no apparatus other than a signal generator and detector are required. It has a limited application but this disadvantage is offset by its simplicity. The second method makes use of a resistance potentiometer of improved design and capable of high order of accuracy at frequencies up to 30 Mc/s. In the third method two inductance type piston attenuators are used. This apparatus has a very high order of accuracy and may be used at frequencies up to the highest now employed for direction-finding purposes. The accuracy and limitations of the three methods are discussed and their merits compared. Details of the construction of the measuring apparatus and its calibration are given, and specimens of error measurements made on various types of goniometer are included. (a-1, b-3, c-1, d-5, e-209, f-Descriptive analysis. See also Abstract No. 2949)

1649. BRAY, W. J., BOURDEAUX, N., AND THURLOW, E., "A Miniature Direction Finding Receiver (Tester WL 53,400)," General Post Office (British), Report No. 894; 6 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1650. BUSIGNIES, H., "Wave Interference Errors in Direction Finders," and "Evaluation of Night Errors in Aircraft Direction Finding," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 34; 8 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1651. MUDGETT, A. H., "Field and Laboratory Tests of Garod Radio Direction Finder Model DN-200B (Frequency Range 270 - 570 Kc)," Signal Corps, Engineering Laboratory, Eatontown, Pennsylvania, Report No. ESL: Report No. 2 (Coles D/F Group); 8 March 1943. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Test)

1652. ANONYMOUS, "Proposed D/F Scheme for UNB," Telecomunications Research Establishment, Ministry of Supply (British), Report No. T.1520; 9 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1653. BURGESS, R. E., "The Causes and Measurement of Unbalance in Radiogoniometers," National Physical Laboratory (British) Report No. RRB/C. 69; 9 March 1943. ABSTRACT: A screened goniometer which is relatively free from error as measured in the usual way with a low mean potential of the field coil terminals may show large errors when the mean potential is raised. Since this condition can occur in elevated H-Adcock systems the unbalance errors of a goniometer are of practical importance. The main sources of unbalance are discussed under the headings:(1) capacitive antenna effect (2) magnetic antenna effect,and (3) impedance of the screen. A simple test unit is described which enables direct measurement of unbalance error to be made in the laboratory under conditions similar to those obtaining in the Adcock system. The method of testing can be applied to the case where long transmission lines are interposed between the aerials and the goniometer. Some typical measurements are quoted for screened goniometer of a type described in a recent report (RRB/C.45). The effect of connecting the search coil in a balanced or unbalanced fashion and of

connecting the halves of the field coils in parallel or series is demonstrated. (a-1, b-3, c-1, d-5, e-44, f-Description)

1654. ANONYMOUS, "Instructions for Homing Device Attachment 'Fanny'," Radio Research Laboratory Report No. 411-30; 13 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1655. ANONYMOUS, "Direction Finding Antenna Study," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 163-A; 23 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1656. MUDGETT, A. H., "The Garod Direction Finder, Model DN-200B, Serial No. 12," Signal Corps, Engineering Laboratory, Eatontown, Pa., Report No. ESRD-D/F-152 (Coles D/F Group); 24 March 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1657. ANONYMOUS, "Description and Operating Instructions for Direction Finder Fu Peil A 70e/f, Mobile," (German: Telefunken) See: Air Document Index No. R2291 F762; April 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Enemy equipment)

1658. ANONYMOUS, "Developments of an Adcock Aerial for Use with Cathode Ray Direction Finder," Canadian National Research Council, Report No. PRA-77; April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

1659. ANONYMOUS, "Principles of the Cathode Ray Direction Finder," Ministry of Aircraft Production (British) Report No. 2530, vol. 1; April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Evaluation)

1660. CLARK, T. H., "Investigation of Errors in Spaced Collector Direction Finder Systems," Federal Telecommunications Laboratories, Nutley, New Jersey, Report No. TM-37; April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

1661. GERBES, W., "Mathematical Method for Resolving a Fix from Known Remote Points," (German: FFI) See: Air Document Index No. R2714 F773; April 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Theory)

1662. HASSELBECK, W., "Direction Determination Free from Night Effect," Hochf: Tech. u. Elek: akus, vol. 61, p. 126; April 1943. See also Wireless Engineer, vol. 21, p. 41; 1944. ABSTRACT: Two or more loops in a horizontal plane are connected in pairs in opposition. (a-6, b-1, c-4, d- , e-0, f-Analysis)

1663. MOUNTJOY, G., "Development of the Lodar Pulse Direction Finding Receiver," Radio Corporation of America: 14-200; See Department of Commerce PB 32733 April 1943. ABSTRACT: This report is a description of pulse direction finding (PDF) receiving equipment designed at the RCA Laboratory on an M.I.T. contract. Three equipments were made and tested. Each equipment is a complete receiving system comprising in one unit the functions of indicator and receiver. Photographs of the equipment are given. The equipment is designed to work with a Bendix No. LP21A loop and cable. A loop coupling transformer matches the loop to the first tuned circuit. The power supply requirements are 400 to 800 cycles, 115 V or 80 V input. The weight of the equipment (less loop) is 22-1/2 lb. All measurements tabulated in this report were taken on the third set at the RCA Laboratory. Measurements on the other two units by two other laboratories are in substantial agreement. A circuit diagram and several wave forms are included in the report. (a-3, b-3, c-1, d-1, e-0, f-Description)

1664. NICOLAS, P., "Pulse Direction-Finding Receiver," Hochf: tech. u. Elek: akus, vol. 61, p. 126; April 1943. See also Wireless Engineer, vol. 21, p. 40; 1944. ABSTRACT: In a system in which the length of the transmitted pulse exceeds the interval between the direct signal and the echo, the pulse image shown on a cathode-ray tube is so positioned that the strongest extinction occurs at the beginning of the oscillogram. By the commutation, during the interval between two pulses, of a directional and a nondirectional antenna, the sum and difference of the antenna voltages are supplied alternately to that deflecting system which is not in use for the time-based deflection. When the directional antenna is so oriented tnat the beginning of the two curves coincide with the dotted center line, the arrival angle of the transmitter is found. (a-6, b-1, c-4, d-4, e-0, f-Descriptive analysis and interpretation of signal display on CRT)

1665. ROSS, W., "Note on the Polarization Error of Elevated H Type Spaced Aerial Direction Finders," National Physical Laboratory (British) Report No. RRB/C.71; 5 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1666. ANONYMOUS, "140 - 600 Mc/s Ship Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey, Report: Proposal No. 178; 8 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1667. CLARK, T. H., "One Year of Development Model DAQ," Federal Telecommunications Laboratories, Nutley, New Jersey, 12 April 1943. ABSTRACT: This report gives the story of the development of the Model DAQ High Frequency Direction Finder. (a-4, b-3, c-1, d-1, e-373, f-Report)

1668. ANONYMOUS, "200 - 600 Mc/s Homing Radio Compass," Federal Telecommunications Laboratories, Nutley, New Jersey, Report: Proposal No. 169; 16 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1669. ANONYMOUS, "Radio - Contract NXs-99866 - Model DAR Direction Finder Equipment - Radio Marine Corp., New York City, Contractor - Tests on Production Equipment Serial #164 - BuShips Problem D18C - Report of Test of," USN NRL Letter No. C-S67/69 9342); 16 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1670. WEINSTEIN, G., "Flight Test Procedure for Radio Compass Calibrations Test Model B-29," Boeing Aircraft Company, Seattle, Washington, Report No. D-4790; 20 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

1671. ANONYMOUS, "Survey of the Work on Direction Finding at Research Establishments in the United Kingdom," National Defense Research Committee, Radio Board, London, England; 22 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Survey)

1672. ANONYMOUS, "Investigation of Direction Finding Errors Due to Site Characteristics: Study of Methods of Reduction of These Errors," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 166A; 23 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1673. ANONYMOUS, "Wireless Direction Finding Involving Ionosphere Reflection," Australia and New Zealand Scientific Research Liaison Office (Australia) Report No. 353; 26 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-11, e-0, f-0)

1674. GILLILAND, T. R., "Coordinated Study of Ionospheric Transmission and Direction Errors at High Radio Frequencies," US Bureau of Standards: Project No. C-13; 26 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

1675. ANONYMOUS, "Survey of Direction Finding Research (Non-Radar)," USN, Naval Attache for Research, London, Report No. 1652; 27 April 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

1676. ANONYMOUS, "Airborne Direction Finding Equipment G IV.4 III," (German: L.N.S.) See: Air Document Index No. R2105 F634; May 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1677. ANONYMOUS, "Cathode-Ray for Pulse Directional Finder Visual Reception," (German: Telefunken); May 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1678. ANONYMOUS, "Direction Finder Installation, Peil A 40," (German: R. M. L.)See: Air Document Index No. R2721 F114, May 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1679. ANONYMOUS, "Direction Finder Installation, Peil A50 & A60," (German:R.M. L.)See: Air Document Index No. R2721 F150; May 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1680. ANONYMOUS, "Preliminary Specification, D/F Equipment FM11, ' Admiralty Signal Establishment (British) Report No. B233/43; May 1943. ABSTRACT: Not available (a-4, b-3, c-1, d-5, e-0, f-Specifications)

1681. GOLDSTEIN, M. K., "General Facility and Constructional Requirements for the Model DAJ Direction Finder Installation," NRL Report No. R-2079; May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1682. JACHNOW, W., "The Calculation of Current Distribution and Radiated Aerial Energy Fed by Damped Travelling Waves; I. Parallel Line," Elekt. Nachr. -Tech. (ENT), vol. 20, p. 115-23; May 1943. ABSTRACT: The damping decrement at the end of the parallel conductor is calculated yielding the energy equation valid for every linear element of the line in form of an integro-differential equation. In the case of straight, parallel lines with equal current amplitude this becomes a soluble homogeneous differential equation of the first order. (a-2, b-1, c-4, d-4, e-0, f-Theoretical analysis)

1683. YAMANOI, S. C., "Manual on Type I Aero. Mark III Radio Homing Gear and Direction Finder Change 2," Naval Training Combined Air Force (Japanese) Report 13. See also NRL Report RS0011014; May 1943. ABSTRACT: Not available. (a-4, b-3, c-6, d-6, e-0, f-Technical manual of instructions)

1684. ANONYMOUS, "Radio Model DAQ High Frequency Direction Finder Installations and Calibrations, Facilities for," NRL Ltr. C-S67/69 (542); 4 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1685. ANONYMOUS, "Report on DF Trials with ASVS/H2S," Telecommunications Research Establishment, Ministry of Supply (British); Report T-1412; 4 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1686. ANONYMOUS, "Proposal for Scanning System for DAQ H.F. Ship Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 190; 8 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1687. HUNTER, A. O., "D/F on Multiple Ray Morse Signals," Admiralty Signal Establishment (British) Report M. 513; 8 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1688. HOPKINS, H. G., "Copy Draft of Talk Given before the D/F Section of N.D.R.C. (13.1) at R.C.A. (Princeton) by H.G. Hopkins, British Central Scientific Office on May 11th,1943," NDRC Div. 13; 11 May 1943. ABSTRACT: Not available. (a-4, b-9, c-1, d-1, e-0, f-0)

1689. PEARCE, R. R., "Radio Direction Finding on Wavelengths between 25 and 50 Cm (1200 - 600 Mc/s) with the 'U' Spaced Aerial System," National Physical Laboratory (British) Report: RRB/C.74; 12 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1690. GOLDSTEIN, M. K., "General Facility and Constructional Requirement for the Model DAJ Direction Finder Installation," NRL Report No. R-2079. See also Department of Commerce PB28762; 15 May 1943. ABSTRACT: This report describes installation arrangements of a Navy model DAJ high frequency flash-bearing direction finder equipment and deals with the necessary preparatory, construction and installation work as well as the materials to be locally procured in advance. A complete DAJ installation is described, covering a continuous (1.5 to 30 mc) frequency range in four bands. Drawings for a preferred DAJ array arrangement and two alternate plans are shown. (a-3, b-3, c-1, d-1, e-0, f-Specification)

1691. ANONYMOUS, "Report on German Radio Equipments, Consisting of Peilgerat 5 Direction Finding Equipment, Type AAF 25 H.F. Antenna, Converter Type U10/S, and 50 Meters of Aluminum Antenna Wire," Army Air Force, Wright Field, Dayton, Ohio, Report No. ARLRT-5-bd; 27 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report on German D/F equipment)

1692. THIAS, P., "Results of Laboratory Tests Made on Radio Set SCR-587," Signal Corps Engineering Laboratory, Eatontown, Report ESRD-df-232 (Coles: D/F Group); 27 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1693. BUSIGNIES, H., "Study of Direction Finder Fundamentals, Polarization Study," Research Project C-58, Federal Telephone and Radio Corporation; 28 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report; summarized in Div. 13-101.2-M7; See Abstract No. 1738)

1694. ERCOLINO, G., AND APPLEGATE, A., "Remote Bearing Indicator Made by Jerome Engineering Co.," Signal Corps Engineering Laboratory, Eatontown, Report ESRD-df-235 (Coles: D/F Group). 28 May 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1695. ANONYMOUS, "Flight Safety Devices, Volume 1, Fundamentals of Radio Direction Finding," (German; L.H.S.)See: Air Document Index No. R2154 F589; June 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1696. ANONYMOUS, "German Radio Receiver, Tornister E.b," Allied Force Headquarters, Signal Section, 849th Signal Intelligence Service; June 1943. See Department of Commerce PB19750; ABSTRACT: The Torn E.b. is a general purpose receiver which had a wide distribution in the German army. It was issued separately for use in intercept work, and was also used in conjunction with several direction finders and transmitters. The set examined was captured on the Tunisian front together with descriptive literature. The pack receiver is a portable, tuned radio frequency, four-tube receiver having a frequency range of 97 to 6970kc, divided into 8 bands. The apparatus can receive cw telegraphy (A1), tone telegraphy (A2), and telephony (A3). The receiver and the requisite batteries and accessories comprise two separate half-packs which can be carried by one man. Photographs, lists of components, and circuit and schematic diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

1697. ANONYMOUS, "Instruction Book for Model DAK-2 Intermediate Frequency Radio Direction Finder Equipment," Federal Telephone and Radio Corporation, Newark, New Jersey See Department of Commerce PB17888; June 1943. ABSTRACT: This is a new type direction finder employing a fixed crossed loop and a sense antenna for use on vessels. It covers the frequency range between 250 and 1500 kc. The equipment is designed for CW, MCW and ICW reception. The book contains sections on the following subjects: Description, fundamentals of direction finding, installation notes and drawings, calibration, location of faults, tube locations, list of major components, parts list by symbol designation, parts lists by Navy type designation, and index of manufacturers. Diagrams and photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1698. ANONYMOUS, "Instruction Book for Navy Models DAG-1 and DAG-2 Portable Radio Direction Finder Equipment," Airplane and Marine Instruments, Inc. See Department of Commerce PB17873; June 1943. ABSTRACT: This manual contains a detailed description of those portable radio direction finders, together with operating and maintenance instructions. The Model DAG is a high frequency portable direction finder suitable for locating radio transmitters of unknown locations. It may also be used to determine the location of receivers with respect to transmitters of known location by triangulation, and as a communications receiver for both CW and amplitude modulated signals. It is normally powered by self-contained batteries. The frequency range of 1.6 mc to 18.2 mc is covered. Supplementary data consisting of tables listing major units, parts and spare parts, color codes, etc., and photographs and diagrams are included. (a-3, b-3, c-1, d-1, e-520 and 536, f-Instructions)

1699. ANONYMOUS, "Instruction Book on Radio D/F Systems," (German: L.H.S.); June 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instruction manual)

1700. ANONYMOUS, "Preliminary Instruction Book for Model AN/ARD-2 Aircraft Radio Receiving Equipment," Midwest Radio Corporation, Cincinnati, Ohio. See Department of Commerce PB 38629; June 1943. ABSTRACT: Model ARD-2 equipment is a non-radiating intercept receiver intended primarily for airborne use. It is designed to detect radar signals beyond the effective range of the radar, to measure carrier frequencies from 80 to 3000 megacycles and pulse repetition rates from 50 to 8000 cycles per second. Approximate location of radar transmitters can also be determined when the directive properties of a given installation are known. The equipment consists of a tunable antenna-detector unit, an amplifier and power supply on one chassis, and a test oscillator. The antenna is mounted at an angle of forty-five degrees in order to receive either vertically or horizontally polarized radar transmissions. The antenna-detector unit is composed of antenna which may be changed to provide three lengths, a diode detector, and a tuning stub. Tuning is accomplished by sliding the shorting bar along the stub. A sliding scale calibrated in megacycles is provided for measuring carrier frequency directly. The amplifier unit contains a three stage pulse amplifier, a trigger circuit, a pulse rate counter circuit, an audio amplifier, a visual signal indicator, and a rectifier power supply. The test oscillator has a fixed carrier frequency of approximately 400 megacycles. A 955 oscillator tube is pulse modulated by a 6SL7GT connected as a multivibrator. Selection of four pulse repetition rates is made available. The power supply is designed to work on 115 volts single phase alternating current from 60 to 2400 cycles. Photographs, drawings, diagrams, charts and curves, and parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1701. BATEMAN, R., "Siting of VHF Direction Finders," U.S. Signal Corps Report No. ORG-P-3-2. See also Department of Commerce PB 22178; June 1943. ABSTRACT: This report contains recommendations regarding the siting of VHF direction finders of the type furnished with SCS-2 and SCS-3 control net systems. It is intended to be used as a guide to siting personnel in the selection of sites for VHF direction finders. The recommendations apply particularly to the siting of direction finders in unfavorable terrain. Two sketches are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1702. FICK, C. G., "Locating Tanks by Radio," General Electric Company, Research Project No. C-61, OEMsr-737; June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1703. McINTOSH, C. H., "Instrument Approach by Radio Direction Finder," Aviation, vol. 42, nos. 5, 6, pp. 224-5, 371-2, 375; May 1943; pp. 206-7, 209, 320; June 1943. ABSTRACT: Article discusses how, in absence of radio directional beams, ordinary direction finder can be used dependably for satisfactory instrument approach. May: No-wind to moderate-wind conditions are covered. June: Problem of approach in high winds is explained, together with plan for approaching under moderate winds without going through boxing procedure. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

1704. RYBURN, W. E., "Instrument Approach Performance Characteristics on Radio Instrument Landing Systems - Part I - UAL - Bendix System," U. S. Civ. Aeronautics Administration - Tech Development Report No. 32, p. 6; June 1943. ABSTRACT: Photographic space-time records of approach paths followed by DC-3 airplane in making 25 instrument landings with pilot under hood, at Oakland, California municipal airport: Bendix type radio instrument landing equipment (equi-signal localizer and constant intensity glide path) was used in all these landings; results presented as curves. (a-3, b-3, c-1, d-1, e-0, f-Evaluation)

1705. HOPKINS, H. G., "The Design and Performance of Rotating H Adcock Direction Finders for the Range 3.75 to 11.3 Metres," National Physical Laboratory (British) Report: RRB/C.76; 1 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1706. ANONYMOUS, "Radio - Model DAQ High Frequency Shipboard Direction Finder - F.T. & R. Company, Contractor - Preliminary Production Model Test of - BuShips Problem No. D20C," NRL Letter: C-S67/69(342); 3 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1707. WIRKLER, W. H., "Preliminary Discussion of Directional Sensitivity of Radio Direction Finder and the Effect of Filter Circuits on Speed and Sensitivity," Collins Radio Corporation, Cedar Rapids, Iowa, Report: CER 113; 3 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

1708. LEVY, G. F., "Report on Navy Aircraft Direction Finders," United Air Lines, Chicago, Illinois, Report No. CP-136; 4 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

1709. CLARK, T. H., "Model DAQ H/F D.F. Sense Balancing Adjustment and Sense Antenna Counterpoise - Dummy Loop Arrangement - Comparison with Model DAR," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 50; 5 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-78, f-0)

1710. PETERS, R. G., "Navigation Aids in Aircraft Communications," Communications, vol. 23, no. 6, pp. 50, 52, 54, 87; 6 June 1943. ABSTRACT: Navigation aids on board aircraft are dependent on assortment of specially designed ground equipment considered as follows: Adcock system; marker transmitter; cone of silence; fan markers; approach marker; simultaneous range station; antennas, electrostatic shielded loop; future developments. (a-3, b-2, c-1, d-1, e-0, f-Description)

1711. BURGESS, R. E., "Considerations in the Design of the Elevated Four-Aerial H-Type Adcock Direction Finder for Short Waves," National Physical Laboratory (British) Report No. RRB/C.83; 7 June 1943. ABSTRACT: This paper discusses the design of the elevated four-aerial H-Adcock system with the object of indicating the main considerations in the design for maximum sensitivity and instrumental accuracy for vertically polarised waves. Two types of system are discussed: (i) The directly-coupled system in which the goniometer and the radio frequency stages of the receiver are situated at the aerials with a downlead carrying the intermediate frequency signals, and (ii) The line-coupled system in which the aerial pairs are coupled by screened transformers to transmission lines which feed the field coils of the radiogoniometer below. In both types the aerial dimensions are considered to be small compared with the wavelength and the aerial impedance is reactive. In Section 2 the design of the aerial system, the aerial coupling circuit and the input circuit of the receiver are analysed from the point of view of obtaining maximum sensitivity (i.e. signal/noise ratio). The directly-coupled type provides the greatest possible sensitivity from a given aerial system. In the line-coupled system the combined effect of attenuation in the line and impedance mismatch at its ends result in practice in an appreciable loss in sensitivity. The importance of accurate tuning of the search coil (which forms the first tuned circuit of the receiver) and of using a low noise valve in the first stage is stressed. In Section 3, the design of the system for high instrumental accuracy is described. The conditions for balancing an aerial pair are considered and it is shown that a high order of symmetry in the aerial system and of balance in the screened aerial transformer or goniometer is required at frequencies in the region of the resonance of the vertical column. Although the existence of column resonance effects presents difficulty in the design of the aerial system, it has been found possible to reduce the resulting errors to a satisfactorily low level. The need for accurate equality of the aerial pairs in order to minimise the quadrantal error is indicated. (a-1, b-3, c-1, d-5, e-45, f-Antenna design)

1712. LUCK, D.G.C., AND NORTON, L.E., "The Measurement of Errors of Radio Direction Finding," Radio Corporation of America, Research Project C-78, OEMsr-838; 10 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Errors)

1713. CLARK, T. H., "Influence of Ground Conductivity on Accuracy of NLS-505 Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 44; 15 June 1943. ABSTRACT: This memo gives the results of practical tests of an operating direction finder using spaced vertical monopoles connected by transmission lines of the horizontal U type. In this system, each monopole's base is connected to a small ground mat which is buried close to the surface of the soil. A short description is given of the theory underlying this design and the results of two typical installations are given. The causes of the inferior results of the second of these installations are analyzed. The means adopted for their correction are given. The results of the correcting means are further analyzed and general conclusions useful for the selection of sites and the installation of such direction finders are enumerated. (a-1, b-3,

c-1, d-1, e-55, f-Conductivity-ground)

1714. GUENTHER, M., AND McCOY, R.E., "Preliminary Investigation of Molded Polystyrene Loops," Signal Corps Engineering Laboratories, Eatontown, ESL Report No. 5 (Coles: D/F Group); 27 June 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Fabrication product evaluation)

1715. ANONYMOUS, "Direction Finding Equipment Peil VI," (German: Telefunken) See: Air Document Index No. R2789 F469; July 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0).

1716. ANONYMOUS, "Installation and Operating Instructions for Mobile Direction Finder Fu Peil A 81a," (German: Telefunken) See: Air Document Index No. R2313 F276; July 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1717. ANONYMOUS, "Instruction Book, Model DAE and Model DAE-1 Radio Direction Finder Equipment," Radiomarine Corporation of America, New York, N. Y. See Department of Commerce PB17874; July 1943. ABSTRACT: The model DAE radio direction finder equipment consists of the following major units: Type CRM-46153 radio receiver (240 to 2000 KC); type CRM-69074 loop assembly; two complete sets of vacuum tubes; and a set of spare parts. The basic power supply is 115 volts, 60 cycles, single phase, A. C. Construction, installation, and operation are described. Appendix contains tables, drawings, photographs, and schematic. (a-3, b-3, c-1, d-1, e-0, f-Instruction)

1718. ANONYMOUS, "Insulating Hood for D/F Outfits FM11 and FM12," Admiralty Signal Establishment (British) Report No. SS106; July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1719. ANONYMOUS, "Manual for the Peil G6 Direction Finder with the APZ Automatic Auxiliary," (German: Telefunken) See: Air Document Index No. R2110 F936; July 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Manual)

1720. ANONYMOUS, "Preliminary Specifications, Admiralty Direction Finder FH4," Admiralty Signal Establishment (British) Report No. B235/43; July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

1721. ANONYMOUS, "Radar Location," (German: O.K.M.); July 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1722. BABCOCK, W. C., "The Average Characteristic Impedance of Multiwire Cylindrical Cage Dipoles," Bell Telephone Laboratories, Inc., NDRC Report No. 966-8, OEMsr-966; July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1723. GONNERMANN, "Effect of Ionosphere Reflection in Producing Radio Compass Error," (German: Z.F.B.) See: Air Document Index No. R2722 F351; July 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1724. JACQUES, R. B., "Antenna Patterns of Special Loop on A-29 Lockheed Hudson Bomber," Ohio State University Research Foundation, Report No. 759-12. See also Department of Commerce PB50841; July 1943. ABSTRACT: Measurements have been made of the patterns of a special loop antenna mounted on the Lockheed Hudson Bomber A-39. The material is presented in two groups. The first group contains patterns of the loop mounted on the ship for two different settings of the series loop tuning capacitor. The second group shows patterns of the same loop mounted on a flat simulated ground plane and also for two different capacitor settings. A sketch shows the details of the construction of the loop. The measurements were made on a 1/10 scale model of the A-29 bomber at a model frequency of 2,000 megacycles. The actual frequency of the full scale model is 200 megacycles. Measurements were made for both vertical and horizontal polarization. (a-3, b-3, c-1, d-1, e-0, f-Experiment)

1725. LUCK, D. G. C., AND NORTON, L. E., "Polarization Errors of Shielded U Adcock Direction Finders," Office of Scientific Research and Development (OSRD) Report No. 1884. See also Department of Commerce PB L87770; July 1943. ABSTRACT: Earlier field calculations are reviewed and the reason for an erroneous result is shown. New field expressions developed to avoid the earlier difficulties are equivalent to simpler forms reported by K. A. Norton, which are here used in new field calculations. Comparative polarization-error tests of an elevated-counterpoise Adcock system with rod and loop test transmitters have given results independtnt of the type of transmitter and of transmitter distance. Computation of spurious effects due to test-field curvature shows them to be sufficient to limit severly the significance of short-range measurements made on good direction finders with rod transmitters. The elevated-counterpoise Adcock is not good enough to encounter such limitations. It shows quite poor pickup ratios, dependent both on frequency and on test-transmitter elevations. Results of earlier tests on the BTL Adcock at Holmdel are compared with newly computed fields and found to represent primarily field-curvature effects. Even the error minima at 5-degree transmitter elevation are qualitatively explained. Some high-angle observations permit tentative assignment of standard-wave errors in the neighborhood of 7-1/2 degrees (50%) and of pickup ratios comparable with those of the elevated-counterpoise Adcock. No fully satisfactory measurement has yet been made of the polarization error of any really good direction finder. Only rather long-range, high-elevation tests can remedy this situation. (a-3, b-3, c-1, d-1, e-170, f-Research report)

1726. PIERCE, J. R., "A Note on the Transmission Line Equation in Terms of Impedance," Bell System Technical Journal, vol. 22, p. 263; July 1943. ABSTRACT: Increased familiarity derived in handling Maxwell's equations, especially in connection with problems arising at very high frequencies, has resulted in a variety of forms for expressing certain laws and behavior. Especially, work by Schelkunoff in extending the impedance concept shows that impedance can be quite as general and exact a means for expressing electromagnetic relations as are current, voltage, electric and magnetic fields, and vector and scalar potentials. In reformulating certain problems in terms of impedance the content and ultimate solution must of course be equivalent. There may, however, be a considerable change of procedure and sometimes a simplification. For instance, in many cases a single impedance condition can replace the usual two boundary conditions for voltage and current. One very simple case in which it is perhaps easiest to deal directly with impedance is in the derivation of the transmission line equation on a distributed constant basis. In the usual derivation, two linear second order differential equations are obtained, one for voltage and one for current. The impedance, in terms of which the engineer expresses many of his results, is obtained as a ratio from solutions for voltage and current. In treating the transmission line from the impedance point of view, without dealing with currents and voltages, a first order non-linear differential equation in terms of impedance and distance is obtained. This impedance equation is a Ricatti equation and could be obtained from the usual line equations. It is simpler, however, to derive it directly. (a-1, b-1, c-1, d-1, e-0, f-Formula)

1727. PARKINSON, T., "Ionospheric Measurement Research at Louisiana State University. July 1, 1942 to June 30, 1943. Final Report," Office of Scientific Research and Development (OSRD) Report No. 1662. See also Department of Commerce PB L87772; July 1943. ABSTRACT: The work on ionospheric measurements at Louisiana State University during the period of July 1, 1942 to June 30, 1943 was concerned with the two major problems: (1) continuous field intensity measurements of transmissions from four selected broadcast stations and analysis of results; and (2) the securing of regular reflection-height records from which useful information about the ionosphere could be extracted. (a-3, b-3, c-1, d-1, e-0, f-Research report)

1728. ROSS, W., AND BURGESS, R. E., "Limitations of the U Type Adcock Direction Finder in the Short Wave Band (Wavelengths 10 - 100 Metres)," National Physical Laboratory (British), Report No. RRB/C.78; ca 8 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1729. BUSIGNIES, H., AND RICHARDSON, A. G., "Demountable Short Wave Type SCR-502: Instantaneous Bearing Indication by Cathode Ray Oscilloscope," Federal Telecommunications Laboratories, Nutley, New Jersey, Project No. C-34; 1 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-TM 11-256)

1730. BUSIGNIES, H., "Investigation Looking toward the Development of a U.H.F. Direction Finder System," Federal Telecommunications Laboratories, Nutley, New Jersey, Project No. C-80; 1 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

1731. CLARK, T. H., "Comparison of Error Curves for Direction Finders," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 52; 6 July 1943. ABSTRACT: This memo attempts to list the best known methods of presenting calibration and error curves for radio direction finders. The methods are compared to determine which method is most suitable for the presentation of data for a particular type of direction finder. (a-1, b-3, c-1, d-1, e-79, f-Evaluation)

1732. ANONYMOUS, "The Development of an Elevated H Adcock Direction Finding System FH2 for the Frequency Band 3 to 20 Mc/s. (15 to 100 Metres)," Admiralty Signal Establishment (British); 7 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Survey)

1733. BURGESS, R. E., "Considerations in the Design of the Elevated Four-Aerial H-Type Adcock Direction Finder for Short Waves," National Physical Laboratory (British) Report: RRB/C. 33; 7 July 1943. ABSTRACT: This paper discusses the design of the elevated four-aerial H-Adcock system with the object of indicating the main considerations in the design for max sensitivity and instrumental accuracy for vertically polarised waves. Two types of system are discussed: (1) The directly-coupled system in which the goniometer and the radio frequency stages of the receiver are situated at the aerials with a down-lead carrying the intermediate frequency signals, and (2) The line-coupled system in which the aerial pairs are coupled by screened transformers to transmission lines which feed the field coils of the radio-goniometer below. In both types the aerial dimensions are considered to be small compared with the wavelength and the aerial impedance is reactive. The design of the aerial system, the aerial coupling circuit and the input circuit of the receiver are analysed from the point of view of obtaining maximum sensitivity. The directly coupled type provides the greatest possible sensitivity from a given aerial system. In the line coupled system the combined effect of attenuation in the line and impedance mismatch at its ends results in practice in an appreciable loss in sensitivity. The design of the system for high instrumental accuracy is described. (a-1, b-3, c-1, d-5, e-45, f-Design)

1734. ANONYMOUS, "Bearing Protractor Calibration Gnomonic Charts for Use in Radio Direction Finding," National Physical Laboratory (British) Report No. WO/NPL. 9; 15 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1735. NORTON, L. E., "Polarization Errors of Shielded-U Adcock Direction Finders," Radio Corporation of America, Camden, New Jersey, Report: Project C-57; 20 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1736. CALVERT, G. W., "D.F. Attachment A.P.Z.5 for Automatically Taking Bearings with Peilgrat 5." Air Ministry (British), Translation No. A.I.2; 21 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-4, e-0, f-Translation)

1737. ROSS, W., "The Effects of Near-By Horizontal Cables on a Rotating Spaced Loop Direction Finder in a Site of Low Conductivity," Paper No. R.R.B/C.80; 21 July 1943. Department of Scientific and Industrial Research, London, England. ABSTRACT: Experiments have been carried out on a site of low conductivity on the effects of leading a cable, such as a power or telephone cable, into a rotating coaxial type spaced loop direction finder operating in the frequency band 3-10 Mc/s. Very large errors can be caused by such a cable. The method which seemed most successful for the elimination of the undesired effects was to break the length of cable nearest to the direction finder, i.e., the innermost portion of the cable, into short lengths not exceeding five feet long, by inserting high frequency chokes at intervals into the last 25 feet of the cable. (a-1, b-3, c-1, d-5, e-227, f-Experimental)

1738. BUSIGNIES, H., AND BAKER, D., "Study of Direction Finder Fundamentals," OSRD 6608, OEMsr-745, Research Project C-58, Federal Telecommunication Laboratories, Inc.; 31 July 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study report, also containing summary of report dated 28 May 1943; Abstract No. 1693)

1739. ANONYMOUS, "D.F. Station Adcock No. 1," Signal Research and Development Establishment (British), Pamphlet No. 409A; August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1740. ANONYMOUS, "D.F. Station Transportable Adcock No. 3," Signal Research & Development Establishment, Ministry of Supply (British) Provisional Pamphlet No. 659A; ca August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1741. BERGTOLD, F., "Direction-Finding Antenna System," Hochf: tech. u. Elek: akus., vol. 62, p. 63; August 1943. See also Wireless Engnr., vol. 21, p. 295; 1944. ABSTRACT: The antenna system consists of a loop having symmetry along its winding axis, and a dipole whose capacitance is increased by "stars" of wires at the ends. These stars of wires upset the magnetic field less than end discs. (a-6, b-1, c-4, d-4, e-0, f-Description)

1742. GROSSKOPF, J., "Rhombic Antennas," Electrotechnische Zeit, vol. 64, no. 31/32, pp. 415-422; August 1943. ABSTRACT: Paper discusses the development of, transmitting and receiving properties of rhombic antennas, and their advantages over other short wave radiators. (a-3, b-1, c-4, d-4, e-0, f-Antennas)

1743. GOLDSTEIN, M. K., "Survey of Techniques for Very-High and Ultra-High Frequency Direction Finding," USN, NRL Report No. R-2143; August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

1744. ANONYMOUS, "Technical Manual Radio Set SCR-292," War Department, Technical Manual No. 11-254; 2 August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Manual)

1745. WIRKLER, W. H., "Very High Frequency Direction Finder Design," Collins Radio Company, Cedar Rapids, Iowa, Report No. CER 114; 2 August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1746. CHESUS, F. O., "Balanced Coaxial Lines Part I; Practical Considerations in the Use of HF Transmission Lines," Federal Telephone and Radio Corporation, Newark, New Jersey, Memo No. 55; 3 August 1943. ABSTRACT: In considering cable balance or unbalance two factors are discussed- the effect of difference in propagation velocity and impedance mismatch. The discussions consider that the difference in propagation velocity exists between two coaxial lines and that the impedance mismatch is a case of a difference in match between two coaxial lines. No venture toward explaining why a difference in propagation velocity or a characteristic impedance difference (if such exists) occurs. The scope of the paper is to show what can result in practice under such conditions. (a-1, b-3, c-1, d-1, e-51, f-Theory)

1747. ANONYMOUS, "V.H.F. Automatic Direction Finder (Development Model) - Description of Apparatus and Instructions for Lining-up and Operating," Standard Telephone & Cables, Limited (British) Report No. 3760/RFC/MST 6972/20; 16 August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1748. CRAMPTON, C., "Range Estimation Trials Using Standard H/F D/F Apparatus Fitted in H.M. Ships," Admiralty Signal Establishment (British) Report No. M.527; 24 August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Test)

1749. ANONYMOUS, "Preliminary Instructions for Radio Direction Finder Central TC-8," War Department; 27 August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1750. ANONYMOUS, "A Course Indicator Using a CRDF Receiver," General Post Office (British) Report No. 790; 31 August 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1751. ANONYMOUS, "FU G 351, Intercept Receiver 351," (German: R.O.L.)See: Department of Commerce PB L 60602; September 1943. ABSTRACT: This set is used for intercepting signals in the 8 to 12 cm wave band, for determining wavelengths and for direction finding. Both AM and FM signals can be intercepted. It is provided with a directional horn antenna which is connected to the receiver by a 2 to 3 meter waveguide. The antenna can be turned through 360 degrees by means of a hand wheel. The receiver uses a double conversion superheterodyne circuit, with intermediate frequencies of 60 and 40

megacycles. The signal from the antenna is mixed with the local oscillator by a crystal mixer. A magnetron is employed as the first oscillator and is tuned by means of an adjustable Lecher line. The 60 mc IF is amplified and mixed with a 100 mc second oscillator, producing a 40 mc second IF. AM or FM reception is selected by switch. Photographs, schematic diagrams, operating instructions, and a parts list are included. (a-3, b-3, c-4, d-4, e-0, f-Instructions)

1752. ANONYMOUS, "Fu G 351 Monitoring Receiver," (German: R.L.M.) See: Department of Commerce PB54574; September 1943. ABSTRACT: Technical manual on the FuG 351. (Korfu), a direction finding system for use against "meddo" and "Rotterdam" in the centimeter range. (a-3, b-3, c-4, d-4, e-0, f-Instructions)

1753. ANONYMOUS, "The 'Berlin' System," (German: Telefunken) See: Air Document Index No. R2052 F43; September 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

1754. ANONYMOUS, "Instructions for Airplane Radio Operators," (German: L.H.S.) See: Air Document Index No. R2813 F597; September 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1755. DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH "Fundamental Principles of Ionospheric Transmission," (British), Her Majesty's Stationery Office, Radio Research Special Report No. 17; September 1943. ABSTRACT: In this book an attempt has been made to to provide a background knowledge of the fundamental principles of ionospheric transmission for those who are interested in short wave communication, particularly those who are engaged in ionospheric measurements and their relation to operational procedure. It is assumed that the reader has some simple knowledge of the ionosphere such as can be obtained from articles in the various radio handbooks, and is rapidly acquired by anyone actively associated with the practical side of the subject. The book is primarily meant for those who can supplement the reading of it by attending a training course, and perhaps even more for those whose task it is in these days to conduct such courses, and who until now have been handicapped by the lack of any book of the scope of the present one. It is realised that in trying to cater for as wide a need as possible, the treatment may be too detailed and academic for some, and too sketchy for others who have had a scientific training, but it is hoped that the book as a whole may be intelligible and useful to those who have to pass over the more difficult sections. (a-1, b-3, c-1, d-5, e-758, f-Theory)

1756. BRAUN AND STARK, "Research on the 'Nurnberg' Procedure," Army Air Force, T-2, Translation No. 777. See also Department of Commerce PB49055; September 1943. ABSTRACT: An apparatus developed by the Flugforschungs Institute at Oberpfaffenhofen for Würzburg-C is described herein. The employment of propeller modulation and its adaptation to the radio direction finding of airplanes under severe atmospheric coverage of interference dipoles is experimentally demonstrated. The apparatus is based on the theory that if a secondary radiating body which periodically changes its reflecting nature is struck by electrical waves, a portion of the waves corresponding to the state of reflection of the radiating body at the time will be reflected. These waves seem to be modulated to the frequency corresponding to one of the reflection periods. The airplane propeller is such a reflecting body which periodically changes its reflection qualities in the case of plane-polarized waves. Description of the apparatus and experimental results are presented. A circuit diagram and oscillograms are included. (a-3, b-3, c-4, d-4, e-0, f-Description)

1757. CHIREIX, ET AL., "Enemy-owned Patents (available to American Industry) Electronics," vol. 16, no. 9, pp. 182-188; September 1943. ABSTRACT: (i) Land-mine locator (H. Chireix): (ii) VHF coupling device giving sine-law coupling with one-turn stator and rotor, for D/F, attenuators, etc. (R. Hardy & P. de Maertelaere: rotor consists of two cut-away hemispherical shells): (iii) secret communication (B. Tenenbaum: several frequencies, quartz-controlled, in succession: particularly suitable for waves below 1 m, when special Lecher systems of concentric type are used): (iv) preventing re-radiation from superheterodynes (W. Dallenbach, A. Allerding, & E. Huttmann: balanced mixing-valve coupling method for waves below 1m): (v) large-screen television projection (H. Strubig: optical storage method, based on colour-changes in alkaline-earth halides under electron-beam irradiation: intermediate-film renewed by image-cancellation: and a variant resembling the Skiatron - 3501 of 1940). (a-1, b-2, c-1, d-1, e-0, f-Patent descriptions)

1758. ECKERSLEY, T. L., "The Investigation of Horizontally and Vertically Polarized Direction Finding on Frequencies of the Order of 20 to 70 Mc/s," Baddow Research Laboratories, Marconi, Chelmsford, England, Report No. TR.451; September 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Study)

1759. GUANELLA, G., "Method and Equipment for Determining the Exact D.F. Minimum," Hochf:tech. u. Elek:akus, vol. 62, p. 96; September 1943. See also Wireless Engineer, vol. 21, p. 295; 1944. ABSTRACT: For obtaining the exact D/F minimum by the comparison of two signal magnitudes, the first signal, dependent on direction and requiring to be adjusted to a minimum, is combined with a second signal also direction-dependent and obtained from the same point in such a way that it reaches a maximum as the first signal passes through its minimum. From these combined signals, a control magnitude is derived which corresponds to the mean value (in time) of the product of both signal magnitudes, and thus to small bearing errors in size and sign, while being little influenced by laterally incident disturbing waves. The two signal-magnitudes may be derived from two loop antennas or goniometer coils at right angles, rotatable about a common axis. For obtaining the correcting magnitude, the two signals may be intermodulated with each other or taken to a wattmeter system. (a-6, b-1, c-4, d-4, e-0, f-Description)

1760. HARDY, R., "V.H.F. Coupling Device Sinusoidal Goniometer," Electronics, vol. 16, p. 184; September 1943. ABSTRACT NO. 1: Brief description of a single turn goniometer for use at v.h.f. Inventor claims the rotor output is nearly sinusoidal. ABSTRACT NO. 2: Radio direction finders that operate on ultra-short waves usually contain one-turn stators and a one-turn rotor. At lower frequencies suitable distribution of the turns permits the current induced in the rotor to be proportional to the sine of the angle formed by the mean plane of the rotor with a reference plane. To obtain a similar purpose with a single-turn rotor is the object of patent application having Serial No. 440,417, by Rene Hardy and Pierre de Maertelaere of Lyon, France. From the illustration it would appear that there are two stators, 37 and 38, each consisting of a single turn. The rotor consists of two hemispherical shells (30 and 31 in the illustration). In each of these the two opposite half-domes are cut away perpendicular to the plane of their base. The half-shells are mounted with their segments staggered by 90 deg. and a metallic connection between them is made at the point marked 34. Wire leads at 35 and 36 are soldered to the shells diametrically opposite this connection. The inventors claim that a rotor of this type is traversed during its rotation by an induced current having substantially a sinusoidal shape. The device is not limited to direction finders, but may also be used for input and output current attenuators for oscillators and amplifiers. (a_1-6, a_2-3, b-2, c-1, d-1, e-0, f-Description (patent))

1761. ANONYMOUS, "Preliminary Instruction Book for Navy Model DAV Portable Homing Direction Finders," National Electric Machine Shops, Washington, D.C. See: Department of Commerce PB17885; 4 September 1943. ABSTRACT: The model DAV-1 radio direction finder is a small, ultra-portable device to permit a paratrooper or others engaged in military operations to obtain an indication of the direction or bearing of a radio transmitting station. It is not intended as a device capable of permitting the obtainment of extremely accurate radio bearings but rather a "homing" device to enable the wearer to move toward and eventually arrive at the point where a transmitter is operating. It is essentially a short (ground wave) range equipment employing a small shielded loop as a collector. Operation, assembly, and maintenance are described, and there are wiring diagrams and a graph showing effective height of the loop. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1762. ANONYMOUS, "Direction Finding Outfits, FV3 and FV4," USN, N.A.R.: X-3646; ComNavEu.; 9 September 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1763. BAKER, S. S., "Comparison of Field Performance of Radio Set SCR-206-E and Radio Set SCR-503-A," Signal Corps, Engineering Laboratory, Eatontown, ESL Report No. 6 (Coles: D/F Group); 11 September 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation test)

1764. PHILLIPS, T., "Extension of the Frequency Range of Radio Set SCR-556-T1," Signal Corps, Engineering Laboratory, Eatontown, Report ESRD-df-380 (Coles: D/F Group); 18 September 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification)

1765. BUSIGNIES, H., "Study of the Direction Finder Fundamentals," Research Project C-58, Federal Telephone and Radio Corporation; 28 September 1943. (Report summarized in Div. 13-101.2-M7.) ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study report)

1766. ANONYMOUS, "Facilities for Direction Finder Research," U.S. Bureau of Standards, Project No. C-81; 29 September 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1767. ANONYMOUS, "Correlation of D/F Errors with Ionospheric Conditions,"Louisiana State University, Project No. 13.2-89; 30 September 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1768. ANONYMOUS, "NVK Crossed-Loop Goniometer-Type Shipboard Direction Finding Equipment According to Navy Specifications NVK-GB/37 with Telefunken Direction Finding Receiver E 374S4/42," (German: Telefunken)See: Department of Commerce PB L67719; October 1943. ABSTRACT: The equipment operates in the frequency range between 222 and 527 kc. The document contains technical data, a detailed description, installation, and operating instructions. Parts lists, diagrams, drawings, and photographs included. (a-3, b-3, c-4, d-4, e-0, f-Description)

1769. ANONYMOUS, "Preliminary Instruction Book for Preliminary Navy Model CXGA, Direction Finding Equipment," General Electronic Industries, Division of Maguire Industries, Incorporated, Greenwich, Connecticut. See Department of Commerce PB38173; October 1943. ABSTRACT: The direction finding equipment described in a non-radiating receiving system for signals in the frequency range of 300 megacycles to 950 megacycles, with possible use from 250 mc to 1000 mc. It is designed to indicate the direction from which the signal is received as well as to provide an indication of the signal frequency and its polarization. The equipment's accuracy is in the order of plus or minus five degrees at 300 mc and plus or minus three degrees at 900 mc; this accuracy maintained whether the signal is horizontally polarized, assuming pure polarization in reception. The equipment may be used on mixed polarization, in which case bearings are taken on both vertical and horizontal polarization and the average taken. Bearings are read by interpolation of the graduations around an indicator which shows visually the direction of the signal's source. The equipment consists of a V-H antenna, antenna drive, power supply, indicator, amplifier-rectifier, distribution box, local oscillator, and cables. An AN/APR-1 receiver is needed for the operation of this equipment, in addition to a power source delivering 110/125 volt, 60 cycle AC. Photographs, drawings, diagrams, and parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1770. ANONYMOUS, "Preliminary Notes for D/F Outfit FV4," Admiralty Signal Establishment (British). Report No. H509Z; October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1771. FRANZ, K., "A Telefunken Direction Finder Receiver Patent," Hochf:tech. u. Elek:akus., vol. 62, no. 4, pp. 127-128; October 1943. Abstract from Wireless Engineer, vol. 21, p. 394; 1944. ABSTRACT: D.R.P. 733 427, applied for July 26, 1939. In order to be able to tell, in a D/F receiver in which the bearing of a station is indicated by a pointer on a fixed scale, whether the station is still transmitting, the scale is made visible (e.g., illuminated) only so long as energy is being received from that station. (a-6, b-1, c-4, d-4, e-0, f-Patent description)

1772. JIRFA, K., "Automatic Direction Finding Arrangement," Hochf:tech. u. Elek:akus, vol. 62, p. 128; October 1943. See also Wireless Engineer, vol. 21, p. 394; 1944. ABSTRACT: An alternating voltage is generated in the output circuit (for example by the combination of a loop voltage and an auxiliary-antenna voltage and a periodic reversed polarity of one of these) which is dependent as to phase on the sense of the bearing and as to amplitude on the deviation of the directive system from the bearing direction. This AC voltage is made to adjust the directive system to the bearing-direction by means of a rotating-field motor with short-circuited armature. (a-6, b-1, c-4, d-4, e-0, f-Patent description)

1773. McLEISH, C. W., "Analysis of Errors in C.R.D.F. Adcock Aerial," Canadian National Research Council, Report No. PRA-101; October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-Analysis)

1774. ALLISON, J. L., "Notes on DF Work at Collins Radio Company," National Defense Research Committee, Division 13, Section No. 13.1; 1 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Progress report)

1775. PEARCE, R. R., "Conducting Mesh Screens for the U-Type Spaced Aerial Direction Finder in the Centimetre Wavelength Range," National Physical Laboratory (British) Report No. RRB/C.85; 1 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1776. ANONYMOUS, "Progress Report on Radio Direction Finder Development Projects for U.S. Navy Department," Federal Telecommunications Laboratories, Nutley, New Jersey; 2 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Progress report)

1777. ANONYMOUS, "Radio - High Frequency Direction Finder Trailer - Washington Navy Yard Constructor - BuShips Problem No. S408T-C - Report of Test on First Installation," NRL Letter Report No. C-S67/69 (342:AGL); 7 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1778. ANONYMOUS, "Errors in Direction Finding for Ranges up to 50 Miles and Frequencies from 2000 to 6500 Kc," Office of Commanding Signal Officer, Report No. 413.44/R526(D/F); 9 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1779. McCOY, R. E., "Reflectors for Radio Set SCR-55?," Signal Corps, Engineering Laboratory, Eatontown, Report No. ESRD-df-387 (Coles: D/F Group); 11 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1780. ANONYMOUS, "Cross-Frame Shipboard Goniometer D/F Installation," (German: Telefunken) OP-32-F2-E-94-47; 12 October 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1781. ANONYMOUS, "Radio - Direction Finder - Japanese Model Captured at Attu - Report of Tests on - BuShips Problem No. S148T-C," NRL Letter Report No. C-S67/69 (342:RFC); 12 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

1782. ANONYMOUS, "Radio - Shipboard RDF Installations - Information Concerning," U.S. Navy Yard, Norfolk, Va.: FS/S67(45-MR) S-974; 13 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1783. ANONYMOUS, "Radio - Model DAK D/F Equipment - Shipboard Location of Collector System - Problem D22CD Progress Report," Navy Radio & Sound Laboratory (Now: Naval Electronics Laboratory), San Diego, California, Report No. ND11/NP22/S67 C-RS-949; 18 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1784. PHELEY, J.K., "Method of Radio Direction Finding for Locating Enemy Radar Stations from Aircraft," Army Air Force, Hdq. 16th Reconnaissance (Joint Electronics Intelligence Agency Report No. 1133); 19 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1785. REICHEL, W. A., "Revolutionary Compass Developed for Airplanes, (Gyro Flux Gate Compass), Gyroscope Used Only for Stabilization," Science News Letter, vol. 44, nos. 17 & 20, pp. 268-307; 23 October and 13 November 1943. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-Description)

1786. ALLISON, JOHN L., "The Shielded Loop Antenna," Private Communication; 25 October 1943. ABSTRACT: A short note which attempts to avoid misconceptions concerning shielded loop antennas. Vertical effect is explained as differences in impedance to ground from each side of the loop conductor. The use of a shield to prevent vertical is explained. The manner in which the loop conductor and the shield act as secondary and primary of a transformer is mentioned. Because

unequal impedances in the lines do not cause vertical effect with the shielded loop, the effect of an off-center or crooked inner conductor will not cause vertical effect, but will only cause a slight loss of sensitivity due to the fact that it will act as a transmission line with discontinuities (the inner conductor is actually nothing more than a transmission line leading from the gap). The directional pattern of the shielded loop antenna is dependent only upon the outer conductor, and no error results from crooked positioning of the inner conductor. This is another important advantage of the shielded loop, because it is simple to build a symmetrical shield whose directional pattern can be accurately observed from its mechanical position. (a-4, b-5, c-1, d-1, e-270, f-Nonmathematical description)

1787. ANONYMOUS, "H.F. Aircraft Radio Compass 15 - 50 Mc/s," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 212; 26 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1788. ANONYMOUS, "Radio - Direction Finder - Model DAB - Effects of Loran Transmission on," NRL, Letter Report No. C-S67/69(342f); 29 October 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1789. ANONYMOUS, "Instructions for Directional Antenna FuMB 10," (German: Blaupunktwerke)See: Air Document Index No. R2500 F42; November 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

1790. ANONYMOUS, "Preliminary Specification Signalling Requirements Direction Finding Outfit FV3," Admiralty Signal Establishment (British) Report No. B204/43; November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

1791. ECKERSLEY, T. L., "Short Wave Direction Finding," Baddow Research Laboratory, Marconi, Chelmsford, England, Report No. TR-454; November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1792. PORTS, D. C., JANSKY, C. M., AND BAILEY, S. L., "Effects of Hills and Trees as Obstructions to Radio Propagation," Jansky & Bailey, Washington, D. C.; November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

1793. SERRELL, R., "Antenna System for Project 'MOTH'," National Defense Research Committee, Report No. 15-867-1; November 1943. ABSTRACT: This report correlates the results of work which was done at CBS (New York) and OSURF (Columbus) during 1943 on the design of suitable loop antenna systems for project "Moth". These aircraft antennas were built to operate at 122 mc. Three separate systems were designed: Two for horizontal polarization and one for vertical polarization. Drawings of the antennas and graphs showing radiation patterns are attached. (a-3, b-3, c-1, d-1, e-0, f-Description)

1794. STRUSZYNSKI, W., ET AL., "The Re-Radiation Frequency Meter. Performance and Application to the Adjustment of H/F D/F Outfits in H.M. Ships," Admiralty Signal Establishment (British) Report No. M.524; November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Equipment)

1795. ZAEPER, C. J., "Simultaneous Direction Finding in Altitude and Bearing," (German) See: Chief of Naval Operations, Technical Intelligence Center, Abstract No. 991-45; 2 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-4, e-0, f-0)

1796. ANONYMOUS, "Description of Japanese Aircraft Homing and Direction Finding Receiver," Army Air Force, S. W. Pacific Area, Enemy Material Report, No. 56; 4 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

1797. MITCHELL, H. T., KILVINGTON, T., AND THOMSON, W. E., "The Evaluation of Bearings for D/F and Other Radio Purposes," General Post Office (British) Report No. 1043; 6 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Evaluation)

1798. ANONYMOUS, "D/F Outfit FV3," USN, N.A.R., London, Report No. X-4548; 12 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1799. ANONYMOUS, "Radio Set SCR-614-A," War Department, Technical Memo No. 11-873; 12 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1800. DORN, A., "Preliminary Specification for the M2300 Direction Finding System," Radio Research Laboratory, Technical Memo No. 411-TM-46. See also Department of Commerce PB14115; 12 November 1943. ABSTRACT: This equipment is an airborne set designed to operate in the range from 250 to 1000 Mc. It indicates frequency and polarization as well as direction of radio signals received within that range. Specifications are given for all components as well as photographs of the completed installation. (a-3, b-3, c-1, d-1, e-0, f-Specification)

1801. ANONYMOUS, "Proposed Navy Shipboard Automatic Radio Direction Finder," Radio Corporation of America, Camden, New Jersey, Report No. AS-5834-G; 18 November 1943. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1802. WOODWORTH, J. D., AND NACE, A., "Captured Japanese Direction Finder and Intercept Receiver, Type 94, Model 1," Signal Corps, Engineering Laboratory, Eatontown, Report No. ESRD-df-426 (Coles: D/F Group); 22 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy-equipment)

1803. ANONYMOUS, "Radio - Pre-Production Model of the DAK-1 (Serial No. 1) Medium Frequency Direction Finder Equipment - Type Test on - F.T. & R. Corp., Contractor - Confidential Contract NXs-1784 - BuShips Problem D26C - Request No. S-380T-C," USN, NRL Letter No. C-S67/69(342); 27 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1804. ANONYMOUS, "Radio - Direction Finder - Simon Radioguide Type Test for Determining Suitability for Naval Service - Report on Problem S389T-C," USN, NRL Letter Report No. C-S67/69; 30 November 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1805. ANONYMOUS, "German-English Glossary: Technical Communications Terms," War Department, Technical Memo No. 30-490; See also Department of Commerce PB48260; December 1943. ABSTRACT: For the most part this glossary concerns itself with words and expressions necessary to the understanding of radio and radar equipment; but to an extent, also included are terms peculiar to meteorology aircraft, photography, terrain, and to a very limited extent, certain military and gunnery terms. (a-3, b-3, c-1, d-1, e-0, f-Glossary)

1806. ANONYMOUS, "Gyro Flux Gate Compass, Bendix Aviation," Electronics, vol. 16, pp. 166-168; December 1943. ABSTRACT: A new compass for aircraft, termed a gyro flux gate compass, eliminates some of the disadvantages of the traditional magnetic compass and its need for constant correction during flight. The instrument contains a gyroscope that rotates at a speed of 10,000 rpm to keep the mechanism level during flight, and a set of coils so arranged that they intercept the magnetic field of the earth and cause electrical impulses through their windings. The pickup coils may be mounted anywhere in the plane. The impulses are transmitted to an amplifier which connects to an indicator having a dial similar to a conventional magnetic compass. The indicator mechanism automatically corrects errors resulting from interference caused by stray magnetic fields from metal objects and electrical equipment in the plane. Auxiliary indicators may be connected to the instrument as shown in the photograph of the demonstration model. This permits the pilot and the navigator to have simultaneous direction readings. The complete instrument is a development of the Bendix Aviation Corp., who report that the compass is unaffected by climbs and dives of the plane and does not lag or overshoot its reading during turns. (a-3, b-2, c-1, d-1, e-0, f-Description)

1807. ANONYMOUS, "Proceedings of the Navigational Conference on December 11, 1943," (German: N.V.W.) See: Air Document Index No. R2097 F898; December 1943. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1808. BOND, D. S., "Visual Direction Finders: Part I - Principles (Two-signal Balanced Modulators: Single-frequency Balanced Modulators: Carrier and Sideband Relations: Motor Control Circuits: System Limitations): Part II - The RCA-Sperry Mark I Automatic Direction Finder for Aircraft," Electronics, vol. 16, no. 11, pp. 140-143, November 1943; no. 12, pp. 140-146 and 324, 325 December 1943. ABSTRACT: Condensed from a chapter of the forthcoming book "Radio Direction Finders;" In distinction to the direction finders of the aural null type which have been extensively described in the literature, there are numerous types in which the proper bearing is determined by means of a visual device. The operator is not required to listen for a minimum signal as in an aural null type, reception with phones being only needed for station identification or for monitoring. The purpose of a visual system of the type discussed in this paper is two-fold: (1) to provide greater convenience or accuracy in indication of bearings, and (2) to permit simple resolution of the 180 deg. ambiguity in bearings which occurs in the accurate null determination with an aural device. Visual direction finders may be grouped in two main classes. Automatic direction finders indicate directly on a 360 deg. scale the station bearing. Right-left types utilize a zero-center meter or similar indicator and indicate deviations in bearing from the manually established loop position. Aural null direction finders are sometimes provided with a tuning indicator or output meter. However, this will not be classed as a visual direction finder, inasmuch as the condition of giving "sense" or of elimination of 180 deg. ambiguity is not fulfilled. A historical summary of the early types of visual direction finders has been given by Tuska, and refers to work by Leib, Busignies, Dieckman and Berndorfer, Hell, and Scheppmann. As a result of work by these, a visual system of the "left-right" type was developed. This system has had widespread use in aircraft in the United States. The device indicates whether the craft carrying the instrument is headed to the left or right or on a desired course. The first successful commercial automatic direction finder in general use in the United States was developed in 1937 jointly by Radio Corporation of America and Sperry Gyroscope Company. Later designs have embodied these same general principles. In order to study the detailed circuit of a self-orienting automatic direction finder, it becomes important to study two topics concerned with circuit operation: (1) balanced modulator circuits and (2) relations of carrier and sideband vectors. First, however, an examination may be made of a block diagram of the direction finder system in which balanced modulators occur. The a-c supply serves to modulate the r-f carrier in the loop channel by means of balanced modulator A. In this the inputs consist of the large-amplitude local a-c signal and a much smaller r-f signal. The difference in amplitude and the fact that two different frequencies are fed in are points of importance. Balanced modulator B is supplied with voltage directly from the a-c supply and also with a signal of this same frequency from the output of the a-f amplifier. (a-1, b-2, c-1, d-1, e-0, f-Description)

1809. CARTER, P. S., "Antenna Arrays around Cylinders," Proc. IRE, vol. 31, pp. 671-693; December 1943. ABSTRACT NO. 1: The effect of a conducting cylinder within an aerial array is examined mathematically, and curves are drawn to illustrate the currents induced as well as the secondary radiation from the cylinder. Three arrangements of dipoles about a vertical cylinder are discussed, those having axes vertical, horizontal, and radial, respectively, and the radiation distributions in 2 planes are given for each. Corresponding curves with no cylinder are given for comparison. Some examples from practical television towers are dealt with, and the effects of varying phase relations between the individual aerials are shown. Practical results are kept separate from the mathematics, and fundamental data are included. ABSTRACT NO. 2: Arrays of dipoles around spires or other vertical supports are useful for the broadcasting of ultra-high-frequency waves. To the author's knowledge no sound method of computing the radiation patterns which takes into account the effect of the support has previously been presented. The three arrangements of dipoles around a vertical cylinder which are of interest are (1) an array of vertical dipoles, (2) an array of horizontal dipoles whose axes lie on the circumference of a circle, and (3) an array of horizontal dipoles whose ends point radially outward. There are several phase relationships for the currents which are of practical interest for each of these arrays. The necessary number of dipoles in various types of arrays to obtain a horizontal radiation pattern approaching a circle within any specified tolerance are shown by curves. The interference phenomena caused by a plane wave passing a vertical cylinder are discussed and shown graphically. Several radiation patterns for one dipole near a cylinder are discussed. A detailed study of a 4-element horizontal dipole array surrounding a cylinder whose diameter is 1.27 wavelengths, or whose periphery approximates that of the Chrysler Building spire at the assigned television frequency, has been made. Both horizontal and vertical patterns for three different phase relationships of the dipole currents have been calculated. Formulas for the radiation patterns for arrays of all three types having various numbers of elements and fed in several different ways are tabulated. The method of obtaining a rigorous solution of Maxwell's equations for a dipole near a long cylinder is outlined. By making use of the reciprocity theorem infinite integrals in the terms of the Fourier-Bessel series are avoided. When the expression for the field from one dipole and cylinder has been obtained it is a simple matter to develop the expression for an array of any number of elements. When the diameter of the support is large in terms of wavelength arrays of two or more tiers are necessary to avoid waste of energy in high-angle radiation. A substantially circular horizontal pattern can always be obtained. (a_1-3, a_2-1, b-1, c-1, d-1, e-2, f-Analysis)

1810. CLARK, T.H., AND SCARBOROUGH, H. B., "Improvement of Band Four of NLS-505 Direction Finder," Office of Scientific Research and Development (OSRD) Report No. 3318, See also Department of Commerce PB L87759; December 1943. ABSTRACT: A previous report described and analyzed poor results obtained from a fixed direction finder installed on a site of low ground conductivity. Means of correcting the operation of one unit (Band 3) of this direction finder was described, and the results of an application of the method was given. This memorandum report describes the performance of Band 4 of NLS-505 direction finder when installed on a site of poor conductivity and gives the results of a similar treatment on such an installation. Two correction curves and two views of Band 4 array are included. (a-3, b-3, c-1, d-1, e-56, f-Modification)

1811. MacALPINE, W. W., "The Radio Goniometer," Communications, vol. 23, no. 12, pp. 36-42, 95-96; December 1943. ABSTRACT NO. 1: An elementary description and discussion of a transmitting type goniometer for use in radio range systems. First and second order design factors are enumerated and discussed, and a short discussion of calibration is given. ABSTRACT NO. 2: Describes the principles, construction and application of the goniometer, as applied to the equi-signal method of guiding an aircraft to an airport. Characteristics are explained with the aid of vector and polar diagrams. The sources of error and methods of test are discussed. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Description)

1812. WHIPPLE, R.T.P., AND MOORE, M., "Preliminary Theoretical Report on the Errors Caused in Bearings by Re-Radiation from a Vertical Conductor Placed near a Spaced-Loop Direction Finder," Admiralty Signal Establishment (British) Report No. M.585; December 1943. ABSTRACT: Preliminary experiments carried out on H.M.S. SALTBURN and described in Report M433 showed that the Spaced-Loop H/F D/F Outfit had certain advantages over the crossed loop system in that it gave smaller errors in D/F bearings. When a D/F is placed on a ship the greatest deviations are usually due to vertical electric currents induced in the various masts, particularly the foremast. Hence, as a first approximation we can represent the effect of the ship's structure by that of its foremast. In this report a theoretical investigation has been made of the deviations which would be produced by the secondary field from a nearby vertical mast when the spaced loops are placed in an otherwise uniform and vertically polarized field from a distant transmitter. It will appear that under these conditions the deviations for the spaced loops are very considerably less than for the crossed loops, and in particular that there is much less likelihood of obtaining re-entrant calibration curves i.e. conditions under which the same D/F bearing corresponds to three different visual bearings. It is assumed in the analysis that the relative amplitude of the secondary field is independent of the direction of the distant transmitter, whilst the relative phase of the secondary field is the sum of two parts, one of which depends on the phase of the currents induced in the mast and the distance of the mast from the D/F, and which is independent of the direction of the transmitter, whilst the other part is equal to the difference of the phase of the primary wave at the mast and at the D/F. (a-1, b-3, c-1, d-5, e-311, f-Analysis; see Abstract No. 1355)

1813. LOVEBERG, A. G., "Effects on Shipboard of HF DF, Radar and Homing Performance Installing of Their Antennas on a Common Mast," USN, NRL Report No. R-2099; 2 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1814. MUDGETT, A.H., AND WOODWORTH, J. D., "Field and Laboratory Tests Made on the Production Models of Radio Set SCR-503-( )," Signal Corps, Engineering Laboratory, Eatontown, Report No. GSEDF-2-435 (Coles: D/F Group); 7 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-tests)

1815. ANONYMOUS, "Radio - Installation and Calibration in D.E. Vessels at New Orleans - Report of Information of," USN, NRL Letter Report No. C-S67/69(342:JRA); 8 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1816. DOUGHARTY, "A Rotating H Direction Finder for Frequencies between 150 and 300 Mc/s (1 and 2 Metres)," National Physical Laboratory (British) Report No. RRB/C.85; 8 December 1943. ABSTRACT Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1817. PETERSON, H.O., AND BLISS, W. H., "Considerations Affecting Choice of Direction Finder Deception Systems," Radio Corporation of America, Camden, New Jersey. Report No. 895-9; 11 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

1818. ANONYMOUS, "Japanese Radio Direction Finders," Office of Commanding Signal Officer, General Headquarters, Southwestern Pacific Area, Station 22; Report No. 22/PR 0008; 20 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

1819. ANONYMOUS, "Handbook of Maintenance Instructions, Radio Compasses, Types MN-26A, MN-26C, MN-26CA, MN-26M, MN-26W, MN-26X, and MN-26Y," U. S. War and Navy Departments, Air Council of the United Kingdoms: Report No. AN-03-10-256; 23 December 1943. See also Department of Commerce No. PB14877. ABSTRACT: Type MN-26 Radio Compass models described in this handbook are similar except in frequency range and input voltage. The MN-26 radio compass equipment is an aircraft navigational equipment which indicates the direction of any desired transmitting station and also functions as a general radio receiver. The radio compass equipment provides the following services: (1) Visible indication, by means of a left-right indicator, of the general direction from which the received signal is transmitted; (2) Radio reception using a non-directional antenna; (3) Radio reception using a loop antenna while flying through areas of rain and snow static; and (4) Visible indication of relative bearing between the aircraft and the transmitting station by means of an azimuth dial. The Radio Compass Type MN-26 operates on three bands. Combinations of various component equipments can be made which will enable frequency ranges from 150 kc to 7.0 mc to be covered. Tuning is manually controlled from a remote control unit which is mounted within easy reach of the operator. The bands are electrically selected by a control at this remote point. The equipment is normally applied to operate from the primary power source indicated in the table but may be converted to operate on 14 or 28 volts by simple wiring changes. Many arrangements and combinations of Type MN-26 Radio Compasses are possible and no attempt is made in this book to describe them. The Type MN-26 Radio Compass is a commercial equipment used by the Army Air Forces. Component parts do not bear AN or Signal Corps nomenclature. (a-4, b-3, c-1, d-5, e-0, f-Instructions)

1820. ANONYMOUS, "The Specification and Application of Earth-Mats for Use with U-Type Adcock H/F Direction Finders (Frequency 3-20 Mc/s)," National Physical Laboratory (British) Report No. WO/NPL .11; 29 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

1821. ANONYMOUS, "Direction Finders - Review of Aerial Photographs of Japanese and German Shore Equipments," NRL, Letter Report No. C-S67/69(340); 30 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Photos)

1822. ANONYMOUS, "Radio - High Frequency Direction Finder Equipment Production Model DAQ, Serial No. 8, Federal Telephone and Radio Corporation, Contractor - Type Test of," NRL, Letter Report No. C-S67/69(342e); 31 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1823. ANONYMOUS, "Radio - Radar Search Equipment - British Admiralty Type FV1 Antenna - Pattern Test of," USN, NRL Letter Report No. C-S67/69(342:JHT); 31 December 1943. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

1944

1824. ANONYMOUS, "Development of Hand Controlled UHF Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey; Proposal No. 236; ca 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1825. ANONYMOUS, "German D/F System for Flying Bombs," NRL Report: RS 008596; 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1826. ANONYMOUS, "Instruction Book for Model CXG-J-4 Direction Finder Equipment," Federal Telephone and Radio Corp., Newark, New Jersey; ca 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1827. ANONYMOUS, "Instruction Book for VHF Radio Direction Finder Equipment 225 - 400 Mc/s," Federal Telephone and Radio Corp., Newark, New Jersey; ca 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1828. ANONYMOUS, "Japanese Direction Finder Type 94 Model No. 1," Signal Corps Engineering Laboratory, Bradley B., No. 4 MIS 689; 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1829. ANONYMOUS, "Model CSGJ-5 Direction Finder Equipment," Federal Telephone and Radio Corp., Newark, New Jersey; ca 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1830. ANONYMOUS, "Model X-DAY High-Frequency Radio Direction Finder " Federal Telephone and Radio Corp., Newark, N. J.; ca 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1831. ANONYMOUS "Preliminary Instruction Book for Model DAX High Frequency Radio Direction Finding Equipment (1.5-22 Mc/s)," Federal Telephone and Radio Corp., Newark, N. J.; ca 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1832. ANONYMOUS, "Preliminary Instruction Book for Model X-DAX Radio Direction Finder Equipment," Federal Telephone and Radio Corp. Newark, N. J.; ca 1944. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1833. ANONYMOUS, "Radio Set AN/TRD-2," Signal Corps, Test Specification No. ESL - 2125; 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specification)

1834. BOND, D. S., Radio Direction Finders, McGraw-Hill Book Co., Inc., New York, New York; 1944. See also Electronics, vol. 17, p. 320; 1945. ABSTRACT NO. 1: This book, which is now out of print, is apparently the only full-length text published in the United States on Radio Direction Finding. Although it is concerned primarily with systems in use prior to and during World War II, it is an extremely useful reference for any work concerning loops or spaced loops. A detailed method of investigation of a loop antenna in a screen room is given. ABSTRACT NO. 2: This book, the third in the McGraw-Hill communication series edited by Beverly Dudley, is the first published in this country exclusively on the subject of direction finders. The author, an experienced engineer in the field of direction finder design, writes specifically for electrical engineers and others having a broad engineering training and little, if any, experience in this particular specialized field. The author has made available in usable and organized form as much of the existing technical data on the development of direction finders as could be crammed into a volume whose size is not so great as to discourage a busy engineer in need of information. Application of the subject matter to specific problems is illustrated by means of examples worked out in the text. The book starts out with a chapter giving general information and standard test procedures on direction finders. These data are tied in with data usually taken in making performance measurements on communications receivers, a goodly part of the material is in handbook form. Chapters on wave propagation, directive antenna systems, aural null direction finders, performance characteristics of loop input circuits, visual direction finders, and radio navigational aids comprise the main body of the text. A rather complete description of the Mark I aircraft automatic direction finder is included in the chapter on visual direction finders. A mathematical appendix is included wherein the derivation of some of the formulas not derived in the text are to be found. The many footnote references and bibliographies at the end of each chapter should facilitate further study on the part of those in need of additional information. ABSTRACT NO. 3: This volume offers a generous collection of information, both theory and practice, underlying the art of radio direction finding and especially some of the more conventional types of equipment. While replete with mathematical background taken from the

literature, the description of systems and equipment and methods of testing is readable without a thorough appreciation of the mathematics. Therefore, the book is recommended to the nontheoretical worker as an introduction to the subject, and to the theoretical man as an indication of the various mathematical problems encountered in securing dependable operation. The introduction deals largely with the various properties of the direction finder as a specialized radio receiver. There are reviewed the methods of testing formulated by the Institute of Radio Engineers and by the Radio Technical Committee for Aeronautics. This chapter includes a 6-page chart of various tests and notes relating to such equipment. The section on wave propagation is a summary of the theoretical work of recent years. It is mainly useful for range computations on the assumption of idealized surface conditions, although some parts are related to the special problems of direction finding. There is a brief treatment of antennas, with emphasis on the simpler types of directive antennas, such as the loop, spaced loops, and Adcock. Errors caused by oblique polarization receive special attention in comparing these types of antennas. In the chapter on aural-null direction finders, there is a special treatment of the phase relations in radio-frequency selective circuits. The phase is usually neglected but becomes an essential factor in combining signals from directive and nondirective antennas for compensation of errors or for sense indication. The thermal noise generated in the receiver is described as one of the factors limiting not only the range but also the precision of direction finding. Three commercial aircraft radio compasses with visual indicators are described in some detail--the Mark I of the Radio Corporation of America and Sperry, the MN 31 of Bendix, and the AV4-8F of RCA. The book concludes with methods of testing directive receivers and of calibrating direction finders by field tests. Incidentally, various types of map projections are described. The radio engineer looking for an inspired treatment of this fascinating subject will be disappointed to find how much space the author has filled with the less interesting mathematical derivations and theoretical background available elsewhere for reference, as compared with the small variety of systems he has selected to describe from the many that have been published. (a_1-4, a_2-2, a_3-2, b-6, c-1, d-1, e-0, f-Book)

1835. BORN, ET AL.,"Suggestions for a Interference-Free Locating and Control Beam System by Means of Two or More Pulse Modulated Frequencies without the Use of Directional Antennas," US Army Signal Corps. See Department of Commerce PB L60629; 1944. ABSTRACT: A control beam is sketched which facilitates flying on a control beam in a very simple manner and with very great accuracy by means of two pulse keyed transmitters operating on different frequencies, and a self-heterodyne receiver. The advantage of this method, aside from its accuracy, lies in the fact that a very simply constructed receiver which operates directly on an instrument, indicates the control beam without the use of a cathode ray tube. A method for automatic bearing determination has been pointed out. The possibility of enemy jamming efforts on this system is discussed and the elimination of jamming transmitters through double self-heterodyning is described. A block diagram and a curve are included. (a-3, b-3, c-4, d-4, e-0, f-Theory)

1836. ESSEN, L., "The Measurement of Balanced and Unbalanced Impedances at Frequencies Near 500 mc, and Its Application to the Determination of the Propagation Constants of Cables," JIEE, vol. 91, pp. 84-95; 1944 ABSTRACT: The apparatus consists of an air-spaced concentric line for unbalanced impedances and a shielded twin line for balanced impedances. The length of line can in each case be varied by means of a moveable bridge carrying a thermojunction unit. The component to be measured is connected to the open end of the line, which is then adjusted to current-resonance by the movement of the bridge. The impedance is evaluated from the readings of resonant length and the width of the resonance curve. Convenient working equations are developed. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

1837. FOSTER, D., "Broad-Band Lobe-Switching Antenna," Radio Research Laboratory Technical Memo No. 411-TM-42. See also Department of Commerce PB14111; 1944. ABSTRACT: A broad-band lobe-switching antenna is described which consists of a small horizontal... mounted with the open end toward-vertical reflecting plate. The driving point and the characteristic terminal resistance are interchangeable. This allows switching the pattern from one side to the other of a vertical plane normal to the reflecting plate. Satisfactory lobe-switching patterns are obtained for two ranges of the ratio of the length of a side of the...to the wave length. These ranges are approximately 0.40 to 0.60 for which the radiation resistance is nearly constant at 90 ohms; and 0.12 to 0.35 in which the radiation resistance is a linear function of the frequency and takes on values from 5 ohms to 72 ohms. Charts and graph. (a-3, b-3, c-1, d-1, e-0, f-Description)

1838. GORDON, R. A., "Captured Axis Equipment," Electronics, vol. 17, p. 94; 1944. ABSTRACT: This is a detailed description of the German FUG-10 panel used in bomber and reconnaissance aircraft. Included in the installation are two separate transmitters and receivers, a direction-finder, blind-landing gear and an intercom system. American manufacturers have exhibited considerable interest in captured Axis equipment, wherever it has been shown. The following detailed description of the German FUG-10 panel used in bomber and reconnaissance aircraft should, therefore, prove useful. The German FUG-10 panel, or rack, contains two transmitters and two receivers. One transmitter and its companion receiver operate in the 300-600 kc band. The other transmitter and its associated receiver operate in the 3000-6000 kc band. Both units employ cw and mcw operation. No voice communication is used. In addition, the following units are mounted on the panel: A remote-controlled direction-finder operating in the 100-1100 kc band, a blind-landing device operating in the 28-32 Mc band, and an interphone system which serves to supply communication to the aircraft crew as well as to interrupt the cw transmission for purposes of ground homing. Equipment is non-crystal controlled and relies on capacitance compensation for frequency stability. Facilities are available for turning a predetermined spot on a dial to a master-signal station which is undoubtedly maintained on frequency by crystal control. This corrects the calibration of the two receivers. The transmitters are then operated at low power and turned to zero beat with the receivers. This can be done during flight to compensate manually for changes in temperature and humidity. (a-1, b-2, c-1, d-1, e-0, f-Description)

1839. GUYOT, E., "Means Used by Aviators for Direction-Finding," Institute de Geophysique et Sciences Diverses, vol. 18, 19, pp. 277-288; ca 1944. ABSTRACT: Two methods of direction-finding are discussed; radiogoniometrical and astronomical. (a-3, b-1, c-3, d-3, e-0, f-Discussion)

1840. HALLBORG, H., "Sun, Earth, and Short-Wave Propagation: Effects of Solar System upon Long-Distance, Short-Wave Communications," Proc. of Radio Club of America, vol. 21, p. 1; 1944. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

1841. LORENZ, C., "Radio Beacons and Direction Finders," (German: A. G., Berlin-Tempelhof); FIAT: Microfilm reel No. B-324, Frames 3307-3931. See also Department of Commerce PB L73974; 1942-1944. ABSTRACT: This microfilm reel consists of technical manuals on beacons and radio direction-finding equipment of various description. (a-4, b-3, c-4, d-4, e-0, f-Microfilm)

1842. MARCHAND, N., "Complex Transmission-Line Network Analysis," Elect. Commun., vol. 22, no. 2, pp. 124-129; 1944. ABSTRACT: A method is given for reducing a complex transmission line network to a conventional transmission line circuit, thus permitting the application of the ordinary equations for such circuits. A number of theorems are enunciated concerning the currents in coaxial and balanced transmission lines and on their shields, and from these theorems the currents flowing in the lines are determined and the equivalent circuits obtained. The method is applied to the analysis of a shielded loop with a break in the shield at the mid-point of the loop and also to a complex network joining two transmission lines of the same surge impedance. (a-3, b-2, c-1, d-1, e-0, f-Theory)

1843. METZ, "DF'ing Device," (German) Field Information Agency, Technical, Joint Intelligence Objectives Agency Report 753: III C/1117; 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1844. PRICE, E. H. AND GILLULE, W. J., "Marine Navigation Aids, The Radio Direction Finder and the Gyro-Compass," Electrical Communications, vol. 22, no. 1, pp. 56-69; 1944. ABSTRACT NO. 1: As is well known, a radio direction finder is a device making use of the directive receiving properties of a loop antenna to determine the direction of an incoming radio signal. On shipboard, the radio direction finder has become an important adjunct to navigation as it enables the navigator to determine the ship's position quickly and accurately in relation to radio beacons aboard lightships or at fixed shore stations. If the Radio Direction Finder were used as a simple homing device, the loop antenna could be made stationary with the plane of the loop athwart the ship's beam. This is, of course, not practical as it would limit the operation and usefulness of the instrument. Hence, the marine type Radio Direction Finder is equipped with a rotatable loop coupled to a pointer so that the direction of the received radio signal may be quickly indicated on an appropriate scale called the bearing or azimuth scale. If the Radio Direction Finder is installed on shore, the pointer indicates

the source of a radio signal or direction on a bearing indicator scale permanently set to indicate the points of the compass. When the instrument is fitted aboard ship, the heading of the ship in relation to true north changes whenever the ship's course is changed so that a fixed scale would only indicate the direction of the received radio signal in relation to the beam of the ship and not its heading. The true direction of the radio signal might then be determined by interpolating the reading of the loop pointer on the fixed bearing scale against the true heading of the ship as indicated by the ship's compass. In order to simplify this operation and prevent the possibility of error, the bearing scale on a ship's Direction Finder is made rotatable. Thus, the bearing scale can be turned to indicate the ship's heading as read from a compass. If the bearing scale is properly set, the direction of the received radio signal may be read directly without complicated interpolation. In early radio direction finders, the rotatable bearing scale could only be set by hand after the ship's heading had been verbally transmitted to the operator by the helmsman. It was found advantageous, on ships equipped with Sperry Gyro-Compasses, to provide a repeater compass in close view of the radio direction finder scale so that the person operating the radio direction finder could accurately set the bearing scale from the repeater compass scale. Thus, the cooperation of a second party was not required. ABSTRACT NO. 2: The Radio Direction Finder, first introduced commercially by the Federal Telegraph Company and the Sperry Gyro-Compass have played and are playing a dominant role in marine navigation, particularly aboard naval craft and merchant vessels. In this article the operation of the radio direction finder and its automatic coordination with the gyro-compass are briefly indicated. The fundamental principles of the gyro-compass are then explained at some length inasmuch as its operation is seldom investigated or clearly understood by engineers in other fields. Further, it is felt that this exposition is of timely interest in view of great maritime expansion necessitated by war conditions. (a_1-1, a_2-2, b-1, c-1, d-1, e-211, f-Navigation)

1845. TWIST, B., "Army Radio Direction-Finding Networks," Electronics, vol. 17, p. 118; 1944. ABSTRACT: Radio Direction-Finding is a method employed to determine in degrees the direction of a transmitting agent, such as an off-course airplane, from a direction-finder station. Such operation is accomplished by the use of a receiver coupled to a specialized type of antenna with which the horizontal angle of incidence of incoming signals from a remote transmitter can be found relative to some predetermined standard, usually true or magnetic North. Because the individual D/F station is capable of obtaining directive bearings only, a number of stations, properly located with respect to the distances over which operation is desired, can be grouped together in a D/F net for the purpose of determining geographical positions. These positions, or "fixes" as they are commonly called, are determined by the central or control station of the net. Individual bearings are obtained from each satellite station and plotted on a chart. Proper evaluation of the point of intersection of the collected bearings results in the fix, which may be reported back to the original transmitting agent or to rescue forces, depending on the circumstance. The direction finder is a natural outgrowth of radio development and radio control. For many years surface vessels and aircraft controlled their movements visually, as no other method was available. Visual control however, is obviously limited by the surrounding terrain, the prevailing atmospheric conditions, the spherical construction of the earth's surface, and many other factors that tend to restrict its usefulness to the immediate surroundings of the observer. With the advent of wireless communications, these limitations were greatly minimized, and the use of direction finding became increasingly important. This discussion is concerned chiefly with the use of direction finding as a radio navigational aid operating in the field of military aviation. While the direction finder is not infallible, nevertheless it has proved itself a vital element in the safe conduct of airplanes over our farflung Army Airways. There are many types of D/F equipment in use throughout the world - most of them employing a loop or Adcock-type antenna array. Generally speaking, the choice of equipment is determined by the operating characteristics desired and the circumstances and conditions peculiar to the sphere of operation. Surface vessels, for example, ordinarily make use of a direction finder whose antenna is of modified loop design, whereas shore-based units usually employ an Adcock arrangement. As Army aircraft radio operation is normally confined to a frequency range between 2 and 12.5 Mc, D/F equipment must be capable of supplying continuous bearing coverage within these limits. Another requirement of satisfactory equipment is the need for obtaining bearings rapidly and with a minimum of the human element involved. Then, too, there are definite advantages in semi-portable equipment which can be installed quickly and disassembled with relative ease. A direction finder manufactured by Federal Telephone and Radio Corp. is used by the AACS. It possesses desirable features for this operation. It is semi-portable and employs a U-Adcock antenna designed for fixed station use. A cathode-ray tube and a motor-driven goniometer provide instantaneous bearings with a minimum of the operator's time and attention. The set is built to withstand the effects of vibration, concussion from gunfire, and general rough use. When used for direction finding, the equipment is continuously variable over a frequency range of from 2 to 10 mc, while its average sensitivity is approximately 5 to 15 microvolts per meter for a ± 2-deg bearing reliability. The indications of the D/F set are continuous and automatic-automatic in the sense that if the direction of the received signal should shift with respect to the azimuth, the indication on the cathode-ray screen would shift accordingly without further tuning on the part of the operator. Through the operation of the goniometer, the cathode-ray tube, and their associated electrical network, a visual trace pattern is projected on the face of the tube. The operator tunes the signal in, reads the two directions indicated, determines the true direction by pressing the sense switch, and reports his findings. As the signal is reproduced in visual form, all searching for aural nulls is eliminated. The operator can read the signal as he takes the bearing, and thus determines the type of transmission, the strength of the signal, the existing noise level, and numerous other wave characteristics common to radio transmission. The modified U-Adcock-type antenna used with the set consists of five antenna masts. Four are installed on the corners of a square measuring approximately 25 ft on each side, and provide two directional pairs of antennas. The fifth mast is placed on the intersection of the diagonals between the corner masts. The five antennas are connected to the goniometer by phase-inverter coupling units and r-f transmission lines. Each phase-inverter coupling unit is installed between the twin coaxial transmission lines and the antenna to combine impedance matching and aperiodic operation. It thus provides a uniform transfer of energy throughout the entire frequency range of the equipment with minimum attenuation from the long transmission lines. The goniometer is a series of a r-f transformers which eliminate the necessity for revolving the antenna. It is composed of six specially designed coils, the coils being wound at critical angles on a special stator. The coils are connected to the two pairs of balanced coaxial transmission lines, which in turn are connected to the antenna. (a-1, b-2, c-1, d-1, e-0, f-Description)

1846. U. S. SIGNAL CORPS, "Miscellaneous Reports on Radio and Radar Equipment, 1941-1944," See Department of Commerce PB-84885; 1944. ABSTRACT: This microfilm reel contains reports on position finding equipment and methods, directional controls for fighter aircraft, "Rotterdam" radar and "Wassermann IV" girder-type radar, as well as instruction manuals for the following equipment: Fu g 200, 214, 218, and 241 radio equipment and the FFO altimeter. In German. Some frames are illegible. Micro SIG IS2. Frames not numbered. (a-3, b-3, c-4, d-4, e-0, f-Microfilmed reports)

1847. U. S. SIGNAL CORPS, "Technical Data, Reports and Wiring Diagrams Covering Radio Direction Finding Methods and Equipment, 1935-1944," See Department of Commerce PB84907; 1944. ABSTRACT: 1430 Frames, Text in German: This reel contains technical data, reports and wiring diagrams from the Drahtlostelegraphische und Luftelektrische Versuchsstation, Grafelfing, and the Flugforschungsinstitut, Oberpfaffenhofen, covering radio direction finding methods and equipment. Micro SIG IS 24. (a-3, b-3, c-4, d-4, e-0, f-Microfilmed reports)

1848. YUDIN, M. I., "On the Location of a Point on a Plane by Cross Bearings from Three Known Points," Bull. Acad. Sci. (U.R.S.S.), ser. geogr. geophys., vol. 8, nos. 2 and 3, pp. 96-102; 1944. ABSTRACT: Experience has shown that in plotting on a chart the position O of a point in a plane by taking bearings from different known points, the most effective results are obtained when these observations are taken from three such points. Because of errors in observations, the straight lines drawn from the three points will not intersect at a single point, but form a small triangle. In the present paper equations are derived for determining the most probable position O' of the observed point within the area of the triangle, and for calculating the quadratic error of such a determination. This is compared with the quadratic error for the case when two observations only are made. The advantages of using three observation points are discussed and methods are indicated for the most rational selection of the observation points. In conclusion, a graphical method for determining O' is described. The method discussed has wide applications in artillery practice and in geodesic surveys. It is also used in radio direction-finding and for various other purposes such as determination of the wind from three angles of drift of an aeroplane. (a-6, b-1, c-2, d-2, e-0, f-Theoretical analysis)

1849. ANONYMOUS, "Airborne Direction-Finding Apparatus G 6 with Automatic Direction-Finder APZ 6- Apparatus Handbook - Appendix 7." (German) See: Air Document Index No. R2143-F631; 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0).

1850. ANONYMOUS, "Installation and Operating Instructions for Direction Finder Fu Peil A 80d," (German: Telefunken) See: Air Document Index No. R2291 F814; January 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions).

1851. ANONYMOUS, "Instruction Book Model AR 8703-BX Radio Direction Finder," Radio Marine Corporation of America, New York City; January, 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions).

1852. ANONYMOUS, "Instrument Flying: Advanced, with Radio Aids," U.S. Army Air Force Tech Order No. 30-10^B-1. See also Department of Commerce PB34521 (78pp.); January 1944. ABSTRACT: This manual provides instructions in advanced instrument flying. The book is divided into the following sections: Altimeter usage; radio aids to navigation; the radio compass; use of the computer; flight plans; planning the instrument flight; and weather flying. Drawings illustrate the manual. (a-3, b-3, c-1, d-1, e-0, f-Instruction)

1853. ANONYMOUS, "The 'Sadir' Receiver R 87," (German: R.M.L.) See: Army Air Force, Air Document Index No. ADI:R2292 F442; January 1944. ABSTRACT: Not available. (a-3, b-3, c-4, d-4, e-0, f-0)

1854. Bedeau, F., "Advantages of a Low-Impedance Loop for Broadcast Reception," Rev. Tech. Comp. Franc. Thomson-Houston, pp. 59-71; January 1944. ABSTRACT: Comparison of the fields from electric and magnetic radiators of interference shows that a receiving aerial should be of the loop type to give the best signal-to-interference ratio. The reduction of antenna effect by balancing or screening the loop is essential for the best performance, and a single-turn loop, coupled by a suitable transformer to the input circuit of the receiver is the system recommended. The pickup factor (hauteur d'entree) is analyzed for this system, and typical measured values in the bands 150 to 300 kilocycles and 600 to 1500 kilocycles are given. (a-3, b-1, c-3, d-3, e-0, f-Analysis)

1855. BOND, D. S., "Visual Direction Finders; Part III," Electronics, vol. 17, no. 1, pp. 144-148 and 202-208; January 1944. See also Parts I and II; November and December, 1943. ABSTRACT NO. 1: Description and circuit of the Bendix Model MN-31 automatic direction finder for aircraft which automatically provides a direct indication of the bearing of the radio station tuned in by the pilot. A self-synchronous repeater system is used for the bearing indicator. The system is of the self-orienting loop type like the RCA-Sperry Mark I system. ABSTRACT NO. 2: A D/F system for aircraft, in which the receiver output is made to rotate the loop automatically to the null position, is described. The amplified signal voltage is fed into a balanced modulator which produces 2 side-bands; and a carrier from a separate nondirectional aerial is added to these in place of the original carrier. The change of phase of the resulting a.f. voltage when the loop is turned through its min. is used to operate a reversible motor coupled to the loop. Practical problems in the equipment are discussed, including means to prevent hunting about the null position, and full circuit details of two types, RCA, Sperry, Mark I, and Bendix M.N.31 are included. (a_1-6, a_2-3, b-2, c-1, d-1, e-0, f-Description for Parts I and II, see Abstract No. 1808)

1856. CLARK, T. H., AND GALANTER, K. S., "Frequency Scanning Direction Finders with Instantaneous Automatic Indication by Cathode Ray Oscilloscope, DAU," Federal Telephone and Radio Corporation, Newark, N. J., Technical Memo No. 61; January 1944. ABSTRACT: A Frequency Scanning Direction Finder with instantaneous Automatic indication developed by Federal Telephone and Radio Corp. is described. Specification requirements for the direction finder, frequency scanner, and the combination are given. (a-4, b-3, c-1, d-1, e-80, f-Description)

1857. FLETCHER, H., "U-Adcock D.F. Station (M.F. Working)," Signals Research & Development Establishment, Ministry of Supply (British) Report No. 894; January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1858. GRAY, M. C., "A Modification of Hallen's Solution of the Antenna Problem," J. Appl. Phys., vol. 15, no. 1, pp. 61-65; January 1944. ABSTRACT: An alternative formula for the input impedance of a cylindrical antenna is derived from Hallén's integral equation. It is shown that the introduction of a variable parameter Z(z) in place of Hallén's $\Omega = \log(4l^2/a^2)$ modifies the numerical results considerably, and leads to much better agreement with experimental evidence. This paper may be regarded as a supplement to a companion paper by S. A. Schelkunoff (see Abstract No. 1860). The latter has discussed the various methods that have been used in work on the antenna problem and has compared the theoretical results with the available experimental evidence. Since all the methods involve approximations, both physical and mathematical, it seems that the best solution must be chosen simply by the pragmatic test of agreement with experiment. From this standpoint the integral equation method of Hallén as applied to a thin cylindrical antenna appears to give much less accurate results than the more physical methods of Schelkunoff or of Siegel and Labus. Yet the integral equation in itself is not invalid and it seems of interest to attempt to modify Hallén's solution, to bring it more nearly into line with the work of the other investigators. (a-1, b-1, c-1, d-1, e 0, f-Theory)

1859. HARRISON, C. W., AND KING, R., "Receiving Antenna in Plane-Polarized Field of Arbitrary Orientation," Proc. IRE, vol. 32, no. 1, pp. 35-49; January 1944. ABSTRACT: Analysis previously made for center-loaded linear receiving antenna of finite cross-section oriented in plane of plane-polarized electric field (indexed from same issue p. 18-34) is extended to include arbitrary orientation with respect to linearly or elliptically polarized field. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

1860. SCHELKUNOFF, S. A., "Antenna Theory and Experiment," J. Appl. Phys., vol. 15, no. 1, pp. 54-60; January 1944. ABSTRACT: This paper presents: (1) a comparison between several approximate theoretical formulas for the input impedance of cylindrical antennas in the light of available experimental evidence; and (2) a discussion of the local capacitance in the vicinity of the input terminals, mathematical difficulties created by its presence, and methods of overcoming these difficulties. No exact solution of the antenna problem is available at present and so far it is impossible to set definite limits for errors which may be involved in various approximations. For this reason in appraising these approximations one is forced to rely on one's judgment and on experimental evidence. It is hoped that this paper will aid in correlating theory and experiment to the advantage of both. (a-1, b-1, c-1, d-1, e-0, f-Theory and experiment)

1861. SMITH, P. H., "An Improved Transmission Line Calculator," Electronics, p. 130; January 1944. ABSTRACT: There was developed and has been in use in the Bell Telephone Laboratories for a number of years, a particularly useful form of calculator for solving radio transmission line problems. The calculator was originally described in Electronics, where it was presented in "cut-out" form. The impetus given to radio development by the war has promoted considerable interest in this calculator among engineers and research workers, particularly in the field of UHF technique where electrical measurements must be made indirectly. Accordingly, it has been felt desirable to again present at this time a comprehensive description of the device. Several new and useful parameters have been added to the original design and the entire calculator has been redrawn to improve its accuracy and facilitate reading the coordinates. The calculator is, fundamentally, a special kind of impedance coordinate system, mechanically arranged with respect to a set of movable scales to portray the relationship of impedance at any point along a uniform open wire or coaxial transmission line to the impedance at any other point and to the several other electrical parameters. These other parameters are plotted as scales along the radial arm and around the rim of the calculator, both of which are arranged to be independently adjustable with respect to the main impedance coordinates. All of the parameters are related to one another and specific solutions to a given problem are obtainable through the use of an adjustable cross-hair index along the radial arm, which extends to intersect the scales around the rim. The parameters which are plotted on the calculator include: I. Impedance or admittance, at any point along the line. (a) Reflection coefficient magnitude. (b) Reflection coefficient angle in degrees. II. Length of line between any two points in wavelengths. III. Attenuation between any two points in decibels. (a) Standing wave loss coefficient. (b) Reflection loss in decibels. IV. Voltage or current standing wave ratio. (a) Standing wave ratios in decibles. (b) Limits of voltage and current due to standing waves. A brief discussion of each of the several parameters and the manner in which they may be evaluated from the calculator will be given. (a-1, b-2, c-1, d-1, e-429, f-Theory. See also H. P. Journal, March 1963 for Negative Resistance Procedure)

1862. ANONYMOUS, "Ultra-High Frequency Shipboard Direction Finder (200-400 Mc)," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 222; 3 January 1944. ABSTRACT: Not available. (a-[illegible], b-3, c-1, d-1, e-0, f-0)

1863. ANONYMOUS, "Direction Finder Frequency Scanning System for Airplanes, Ships and Shore Use (20 to 100 Mc/s)," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 223; 7 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1864. ANONYMOUS, "Instructions for the Shipboard Installation of Model DAQ High Frequency Radio Direction Finder Equipment; B Edition, including Appendix A and Appendix B," U.S. Navy, Bureau of Ships. See Department of Commerce PB17480; 10 January 1944. ABSTRACT: This instruction book describes the general shipboard installation arrangements and procedures for model DAQ high frequency direction finder equipment, and deals with the necessary fabrication and installation work to be done by each Navy Yard, building yard, or contractor. The model DAQ equipment is a new type direction finder using fixed crossed loops mounted atop the mast on naval vessels. It employs a rotating goniometer to permit automatic cathode-ray indication of bearings on signals in the frequency range from 1.5 to 22.0 megacycles. Photographs and diagrams illustrate the installation of the equipment. The two appendices give instructions for the assembly of the sense antenna and counterpoise elements of the CFT-69083 crossed loop and sense antenna assembly which is a unit of this equipment. (a-3, b-3, c-1, d-1, e-0, f-Instruction; See Abstract No. 1870)

1865. ANONYMOUS, "Radio Set SCR-502-T2 (Electronic Goniometer), Preliminary Technical Information," Signal Corps Engineering Laboratory, Eatontown (Coles: D/F Group); 10 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1866. ANONYMOUS, "Educational Program for Direction Finder Personnel," Federal Telephone and Radio Corporation, Newark, New Jersey; Proposal No. 227; 13 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1867. ANONYMOUS, "Radio Homing of Unrotating Projectiles," Royal Aircraft Establishment, Ministry of Aircraft Production (British) Report: RAD/5899/BAS/14; 14 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1868. ANONYMOUS, "Radio-Model DAE-1 Direction Finder with Pedestal Extension - Type Test of - BuShips Problem S515," NRL, Letter No. C-S67/69 (342:FTC); 14 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1869. ANONYMOUS, "Direction Finder for Airplanes, Ships and Ground Use (100-160 Mc/s)," Federal Telephone and Radio Corporation, Newark, N. J., Proposal No. 224; 15 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1870. ANONYMOUS, "Specifications for Shipboard Installation of Model DAQ High Frequency Radio Direction Finder Equipment," U.S.N. BuShips, RE-13A-803B; 15 January 1944. See Department of Commerce PB17480. ABSTRACT: This specification describes the general shipboard installation arrangements and procedures for Model DAQ High Frequency Direction Finder Equipment, and deals with the necessary fabrication and installation work to be done by each Navy Yard, building yard, or contractor. The Model DAQ equipment is a new type of direction finder using fixed crossed loops mounted atop the mast on naval vessels. It employs a rotating goniometer to permit automatic cathode-ray indication of bearings on signals in the frequency range from 1.5 to 22.0 megacycles. (a-1, b-3, c-1, d-1, e-845, f-Specifications)

1871. BAKER, S. S., "Loop Assembly AS-4/GR," Signal Corps, Engineering Laboratory, Eatontown. ESL Report No. 12; 18 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1872. ANONYMOUS, "Radio - Calibration of D/F, by Target Boat - Minimum Permissible Distance for - Investigation of - BuShips Problem D22DC," USN, Radio & Sound Laboratory (now Naval Electronics Laboratory), Report No. ND 11/NP22/S67 C-RS-1058; 19 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1873. LANGMUIR, D. B., "Direction Finding Activities in the United Kingdom," British Branch, Radiation Laboratory, Massachusetts Institute of Technology; Division No. 1; 22 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1874. MOORE, C. B., "Flight Tests Conducted with Radio Set SCR-291-A," Signal Corps, Engineering Laboratory, Eatontown, Engineering Memo No. 32; 22 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1875. ANONYMOUS, "Radio - Direction Finder - Type Test of Model DAB-1 Direction Finder Equipment - Interim Report on Problem Number S520-T-C," NRL, Letter Report No. C-S67/69(342:AGL); 24 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1876. ANONYMOUS, "Radio - Model DAK D/F Equipment - Shipboard Location of Collector System - Midship Sites on Am-316(AM-57 Class) - BuShips Problem D22CD," USN, Radio & Sound Laboratory (now Naval Electronics Laboratory), Report No. ND11/NP22/S67 C-RS-1061; 25 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1877. CLARK, T. H., "Determination of Mast Resonant Frequency," Federal Telephone and Radio Corporation, Newark, N. J., Technical Memo No. 62; 27 January 1944. ABSTRACT: This memorandum covers one experiment carried out on board a destroyer escort vessel fitted with a production Model DAQ Equipment. The experiment was conducted in an attempt to discover some suitable means of determining the resonant frequency of the mast on which the DAQ collector was mounted. At the conclusion of this memorandum, further tests are described and recommended as a continuation of the work. (a-1, b-3, c-1, d-1, e-81, f-Test description)

1878. WOODWORTH, J., AND HOLT, G., "Navy Model DAB-3 Direction Finder," Signal Corps, Engineering Laboratory, Eatontown, ESL Report No. 13 (Coles:D/F Group); 27 January 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1879. ANONYMOUS, "Airborne Search Apparatus SN 2," (German) See: Air Document Index No. R2051 F343; February 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1880. ANONYMOUS, "Aircraft Direction Finding Equipment, Peil Gerāte-bord- Peil G-5," (German L.H.S.) See: Department of Commerce PB51703; February, 1944. ABSTRACT: The entire document consists of circuit drawings and diagrams of direction finding equipment consisting of radio compass, runway localizer, and receiver FuG-10 equipment. (a-3, b-3, c-4, d-4, e-0, f-Enemy equipment)

1881. ANONYMOUS, "Direction Finding Equipment (Airborne)," (German) See: Air Document Index No. R2114 F604; February, 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1882. ANONYMOUS, "Instruction Manual for D/F H/F Receiver CRDF Type D.F.R.-23," Canadian National Research Council, Report No. CAP-63-23; February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-Instructions)

1883. ANONYMOUS, "Preliminary Instruction Book for Model X-DAU High Frequency Radio Direction Finder Equipment (1.5 - 22 Mc/s)," Federal Telephone and Radio Corporation, Newark, N. J.; February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1884. BRECKENRIDGE, F. C., AND PROJECTOR, T. H., "Construction of Goniometer for Use in Determining Candlepower Characteristics of Beacons," US Civil Aeronautics Administration, Technical Development Report No. 39, p. 8; February 1944. See also Engineering Index, p. 278; 1944. ABSTRACT: A goniometer of sufficient capacity to mount Civil Aero. Adm. 36 in. beacon or 60 in. reflector was designed to rotate this equipment through horizontal and vertical angles, and to set and hold angles to accuracy of ±0.01° about either axis. (a-6, b-3, c-1, d-1, e-0, f-Description)

1885. GIACOLETTO, J. P., "Experiments Related to the Improvement of the Elevated-H Type Direction Finder," Collins Radio Company, Cedar Rapids, Iowa; Report: CER 117; February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1886. HEROLD, F., "Possibility of Quickly Spotting Enemy Planes Carrying Radar Sets," (German) See: Air Document Index No. R2090 F237; February 1944. ABSTRACT: Not available (a-4, b-3, c-4, d-4, e-0, f-0)

1887. MÜLLER-STROBEL, J., AND PATRY, J., "The Calculation of Auxiliary Functions for Straight Receiving Aerials of Any Height," Helv. Phys. Acta., vol. 17, no. 2, pp. 127-132, and no. 6, pp. 455-462; February and June 1944. ABSTRACT: Starting with the Hallen theory of aerials, a closed formula (approximate) is found for the current in a straight cylindrical aerial of length 'l'. For various values of l the current is plotted against the aerial resistance. A numerical example is given. (a-3, b-1, c-d, d-13, e-0, f-Formulae)

1888. RUNGE, "Homing Antenna Device 'Knickerbein'," (German: L.H.S.)See: Air Document Index No. R4007 - F582-617; February 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1889. STRUSZYNSKI, W., MARSHALL, J.H., AND EDWARDS, A. T., "Report on Trials Carried Out to Find the Effect on the Accuracy of H/F D/F of Aircraft Parked near the H/F D/F Mast," Admiralty Signal Establishment (British) Report: No. M.598; February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1890. WOOD, F., "The Effect of Phase Difference between Two Signals When Compared by the Goniometer Method or the C/R D/F Method," Royal Air Force, Headquarters Group (British) Report No. 60; February 1944. ABSTRACT: Not available (a-4, b-3, c-1, d-5, e-280, f-0)

1891. ANONYMOUS, "Radio - 100 to 1500 kc 10 to 25 Watt Transmitting Equipment - Calibration of Medium Frequency DF," USN, Radio & Sound Laboratory (Naval Electronics Laboratory) Report No. ND11/N-22/S67(3) C-RS-1071; 1 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Equipment)

1892. CHRISTENSEN, J. W., AND MOYER, R. C., "Revised Operating Instructions for the C2100 'Setter' Direction Finder," Radio Research Laboratory Report No.411-1B-9A. See also Department of Commerce PB14412; 1 February 1944. ABSTRACT: The "C2100 Setter" Direction Finder is a null type direction finding attachment for use with any receiver having suitable frequency range and sensitivity. One antenna head operates on either horizontal or vertical polarization over a frequency range of approximately 1.5/1. The operating instructions include specifications, unit description, drawings and photographs. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1893. HARBURY, P. L., "M3100 Homing Device," Radio Research Laboratory, Report No. 411-TM-67; 1 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1894. MARCHAND, N., "Demonstration of Model CXFF Direction Finder System 140-600 Mc/s Great River," Federal Telephone and Radio Corporation, Newark, N. J., Report No. 83 (Internal Development); 3 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1895. ANONYMOUS, "Radio - Medium Frequency Direction Finder - Model DAK-1 - Report on Installation in USS Barton, (DD722)," NRL, Letter No. C-S67/69(342:FTC); 5 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1896. ANONYMOUS, "Radio - Model DAK-1(Serial No. 5) Medium Frequency Direction Finder - Report on Pilot Installation in the USS CHARGER (CVE-30)," NRL, Letter No. C-S67/69-(342:FTC); 5 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1897. GOLDSTEIN, M. K., AND SHEETS, M. J., "Interpolation Charts for H/F D/F Shipboard Calibration," NRL Report No. R-2229. See also Department of Commerce PB28816; 5 February 1944. ABSTRACT NO. 1: An investigation has been made to determine means for providing convenient and accurately corrected Naval shipboard direction finder bearings for any frequency within the H/F direction finder band without requiring more than a limited and feasible number of specific calibrations of the equipment. Interpolation charts have been developed which simplify the plotting and application of direction finder calibration curves and furnish the desired corrected D/F bearings for the calibrated and for all other frequencies between those on which calibrations have been made. Means are discussed for choosing the optimum number and spacing of frequencies to be calibrated in terms of the probable interpolation accuracies that may be expected. A practical rapid calibration method is proposed to improve the efficiency and accuracy of making calibrations. ABSTRACT NO. 2: This report describes the development of a means for providing convenient and accurately corrected Naval Shipboard direction finder bearings. Interpolation charts were developed to simplify the plotting and application of direction finder curves and furnish the desired corrected D/F bearings. Means are discussed for choosing the optimum number of frequencies and their spacing to be calibrated in terms of probable interpolation accuracies that may be expected. A practical rapid calibration method is proposed to improve the efficiency and accuracy of making calibrations. Tables and calibration interpolation charts are included. 31 pages. (a_1-1, a_2-4, b-3, c-1, d-1, e-844, f-Calibration)

1898. CHRISTENSEN, J. W., "The C2100 Airborne Direction Finder," Radio Research Laboratory Report No. 411-TM-61. See also Department of Commerce PB14130; 7 February 1944. ABSTRACT: A brief description of a light and compact null direction finding attachment for standard receivers. Three separate antenna mounting assemblies have been designed. A diagram and photograph are attached. This report is supplemented by additional reports. The equipment is designed to operate in the frequency range of 100-450 Mcs. (a-3, b-3, c-1, d-1, e-0, f-Description)

1899. CLARK, T. H., "Sense Collector for Shipboard High Frequency Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 64; 11 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-83, f-Description)

1900. CRIPPEN, D. S., AND ASTHOLZ, P. T., "Radio Compass AN/ARN-7: Performance Test Communication and Air Navigation," Aircraft Radio Laboratories, Wright Field, Dayton, Ohio; Test Report No. 261; 13 February 1944. See also Department of Commerce PB6216. ABSTRACT: This report consists of 8 pages and a 76-page Appendix enclosure. The purpose of this test report is to provide information showing whether the preproduction sample Radio Compass AN/ARN-7 submitted by Bendix Radio, Division of Bendix Aviation Corporation, to representatives of the Aircraft Radio Laboratory at the plant of Bendix Radio on 21 February 1944 meets the requirements of Restricted Signal Corps Specification No. 271-1719 dated 1 April 1943 except as changed by the contract. The preproduction sample Radio Compass AN/ARN-7 submitted on Contract No. W2126-sc-1817, Order No. 11756-WF-43, meets all of the electrical performance requirements of Restricted Signal Corps specification No. 271-1719 dated 1 April 1943, except as changed by the contract, with the following exceptions: (a) Marker Beacon Requirements at Low Temperatures, Specification Paragraph E-1j; (b) Resonance Stability at Low Temperatures, Specification Paragraph E-15e; (c) Sensitivity (antenna) and Sensitivity (loop) at Low Temperatures and Low Input Voltage, Specification Paragraphs E-16b and E-17f; (d) Variation with Service Conditions (compass), Specification Paragraph F-18k(3). It is concluded that the preproduction sample Radio Compass AN/ARN-7 is acceptable and that the contractor should be allowed to proceed with production for the following reasons: (a) The faults noted in; (2) above and in Section E were also present in production Radio Compasses (SCR-269-G which has been generally considered as satisfactory in service; (b) No time is available for the major redesign that would be required to eliminate the faults since Radio Compass AN/ARN-7 is a substitute for Radio Compass SCR-269-G. The quantity of Radio Compasses SCR-269-G available for installation in future production aircraft is small and all orders for Radio Compass SCR-269-G have been completed. (a-1 and 4, b-3, c-1, d-1, e-845, f-Test report)

1901. ANONYMOUS, "Radio-Direction Finder Development of Demagnetizer (RA X10316) for ABI Units of Model DAG and DAK - Report on,"NRL: Letter No. C-S67/69(342:JCC); 21 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1902. ANONYMOUS, "Air to Homing Tests," Army Air Force: Board Project No. (M-2)43; 22 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1903. ANONYMOUS, "Aircraft Direction Finder with Sector Operating Antenna 300 to 1000 Mc/s," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 228; 22 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1904. ANONYMOUS, "Radio - Direction Finder - Model DAA Medium Frequency Equipment, Contract C-NXs-1748, F. T. & R. Corp., Contractor - Problem S535T - C - Type Test of Pilot Installation (DuPont, South Carolina) - Report on," NRL: Letter Report No. C-S67/69(340:312); 22 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1905. ANONYMOUS, "Radio - Model DAU Direction Finders - Receiver Frequency Drift Characteristics - Report on," NRL: Letter Report No. C-s67/69(301b:312); 23 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1906. ANONYMOUS, "C-2100-D D-F System," Radio Research Laboratory: Transition Memorandum Report No. 411-TMR 63E; 25 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1907. ROSS, W., "Note on the Effect of Non-uniform Current Distribution in Spaced-Loop Direction Finders," National Physical Laboratory (British) Report RRB/ca9; 26 February 1944. ABSTRACT: The effect of the essentially non-uniform current distribution in the loop aerials of spaced-loop direction finders is considered. With vertical coaxial systems as commonly employed, no first order undesired effects result from this non-uniform current distribution, but with coplanar systems, serious effects give rise to polarisation errors which will occur for certain arrangements of the aerials. In particular, that arrangement of the aerials in a horizontal coplanar system, which at first sight, seems most natural, gives rise to polarisation errors of such magnitude that the system is to all intents and purposes useless as a direction finder. Fortunately, there are simple arrangements of the aerials which do enable a horizontal coplanar arrangement to be designed so as to be quite free from those undesirable effects. The above deductions are entirely theoretical, but there seems little reason to doubt the truth of the main conclusions. (a-1, b-3, c-1, d-5, e-228, f-Analysis)

1908. ANONYMOUS, "Radio-Direction Finding - Report on Problem S331R-C Development of Small Portable D/F Equipments, Model DAV," NRL: Letter, C-567/69(342-DG); 28 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1909. BATEMAN, R., HERBSTREIT, J. W., AND ROCKWOOD, W. F., "Range of Automatic Radio Compass Type SCR-269 for Homing on Radio Transmitting Equipment Type AN/CRN-4 for Tactical Use in the European Theater of Operations," OCSigO:ORB-P 17-1 NRL:RS 14671; 28 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

1910. HARBURY, P. L., "M4503 Spinner for the M4100 Shipborne Direction-Finding System," Radio Research Laboratory: Transition Memorandum Report No. 411-TMR-110H; 29 February 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1911. ANONYMOUS, "Aircraft Radio Equipment for Me 110 Fighter," (German: Messerschmitt) See: Air Document Index No. R2604 F88; March 1944. ABSTRACT: Not available. (a-4, b-3, c-d, d-4, e-0, f-Description)

1912. ANONYMOUS, "Description and Operation Instructions for Direction Finder Fu Peil A 60D, Fixed," (German: Telefunken) See: Department of Commerce PB54310, 41 pp.; March 1944. ABSTRACT: Fu Peil A 60 d is a fixed, ground direction finder. It can take bearings on modulated and unmodulated transmitters that have a frequency coverage of 72.5 to 860 kilocycles. The receiver range is divided into five different bands. The antenna system consists of four vertical masts. Installation and operating instructions, parts list, trouble-shooting chart and circuit diagrams are included. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Description)

1913. ANONYMOUS, "E/F Technique in the Army," Department of Scientific Research and Experiment, Admiralty (British) Air Technical Report Translation No. 295; March 1944. Abstract: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

1914. ANONYMOUS, "Preliminary Instruction Book for Model DBC and DBC-1 Ultra-High Frequency Shipboard Direction Finding Equipment," Federal Telephone and Radio Corporation, Newark, New Jersey; See Department of Commerce PB38632; March 1944. ABSTRACT: The equipments described are portable units designed to provide directional bearings on transmitters operating within the frequency range of 100 MC to 600 MC. Type DBC is horizontally polarized, while the Type DBC-1 is vertically polarized. The various elements of each unit are mounted on a movable table which rotates 360 degrees on the apex of a tripod. This direction finder consists essentially of a collector system comprising three separate antennas, receiver, and headphones for providing aural indication of received signals. Two similar, balanced dipoles are mounted on a reflector. Received signals are conducted to the receiver by means of transmission lines of identical length but reversed in phase with respect to each other. Both of these transmission lines are brought together at a junction. From this junction point another transmission line leads to the balance conversion box which changes the balanced transmission line into an unbalanced transmission line. The receiver input is connected to this unbalanced line for direction finding. A separate search antenna is used for searching. The receiver used with this equipment is the Model An/APR-1, which is a superheterodyne operating from 115,60 cycle power source but which is not supplied with the equipment. Photographs, drawings and charts are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1915. ANONYMOUS, "Radio Set SCR-503-A," US War Department, Technical Manual No. 11-246A. See also Department of Commerce PB-39421; March 1944. ABSTRACT: Radio set SCR-503-A consists of two portable direction finders, each an independent operating unit and each differing from the other in frequency range. One unit covers the range of 1 to 3 mc in 2 bands; the other covers the range of 100 to 1000 kc in 3 bands. Each receiver is a specially designed twin-channel superheterodyne for amplitude-modulated or c-w signals; and operates from a dynamotor power supply. Provision is made in control unit RM-35-A for switching the output of the set to a telephone line when the output jack of the receiver is connected to the control unit by a patching cord. Switching is also provided in the control unit for connecting the operator's headset to a telephone line for communication with a remote station and to the radio set at the same time, or to either alone. Description of the components and functioning of parts and installation and operation and maintenance instructions are given. Table of replaceable parts, list of manufacturers, photographs, drawings, block, cording, functional and schematic diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1916. CRONE, W. "Possibilities and Limitations of Direction Finding with Sky Waves," Development of Scientific Research and Experiment, Admiralty (British) Air Technical Report. Translation No. 300; March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

1917. FRASER, A. R., AND UNDERHILL, E. J. W., "Report on the Photo D/F Plotter," Admiralty Signal Establishment (British) Report No. M.605; March, 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1918. IRION, D. P., "Operational Report on German D/F Trailer in Tactical Use," Signal Corps, Enemy Equipment Intelligence Service Report No. 10-5.1; March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

1919. JANNSEN, H., "Receiving and Direction Finding Installations with Bunched Characteristics (Sector D/F Installation)," Department of Scientific Research and Experiment, Admiralty (British) Air Technical Report No. 294(Translation); March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

1920. PFISTER, W., "Considerations on the Physical Limits for the Possible Methods of Navigation with Ground Waves," Department of Scientific Research and Experiment, Admiralty (British) Air Technical Report: Translation No. 292; March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

1921. VILBIG, F., "Measurements on Long and Very Long Waves," Department of Scientific Research and Experiment, Admiralty (British)

Air Technical Report; Translation No. 304; March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

1922. WAECHTLER, M., "Some D/F Methods Used in the German Navy," Department of Scientific Research and Experiment (British) Air Technical Report: Translation No. 293, March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

1923. ANONYMOUS, "Radio - Direction Finder - Medium Frequency Model DAK-1 (Serial No. ( ) - Report on Pilot Installation in the KENDRICK (DD612)," NRL, Letter No. C-S67/69(342:FTC); 4 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1924. ANONYMOUS, "Radio Set SCR-503-B," US War Department, Technical Manual No. 11-246B. See also Department of Commerce PB-41245; 4 March 1944. ABSTRACT: This equipment consists of two portable field radio direction finders, each covering a different frequency range and each capable of receiving both amplitude modulated and c-w signals. Each direction finder is supplied with a storage battery, power supplies, and other equipment needed to make the unit self-contained. The set also includes two control units, which connect the radio receivers into a two-way telephone system for communication with other direction finders. Receiver unit RC-1003-B covers 100 to 1000 kcs in three bands, while receiver unit BC-973-B covers a range of 1000 to 3000 kcs in two bands. Both are of the superheterodyne type and operate from a 12-volt storage battery through a dynamotor unit. The equipment is capable of providing: The direction of a transmitter operating on its frequency range, the location of transmitter in conjunction with another direction finding station, and communication with other direction finding stations. Photographs, diagrams and a parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instruction)

1925. ANONYMOUS, "Experimental Investigation of the Polarization Error of the U-Adcock Direction Finder with Various Forms of Earth Screens (Interim Report)," National Physical Laboratory (British) Report: WO/NPL.8; 12 March, 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1926. CLARK, T. H., "Completed Development Report Hand-Controlled Ultra-High Frequency Direction Finders," Federal Telephone and Radio Corporation, Newark, N.J., Technical Memo No. 72; 17 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1927. DINGER, H. E., "Test of a Special Model DP Direction Finder Equipment Incorporating a Balanced Amplifier," NRL Report No.R-2221. See also Department of Commerce PB28728; 17 March 1944. ABSTRACT: This equipment is essentially a model DP-4 direction finder with the loop connected directly to the receiver through the loop cable with the exception that the receiver until incorporates a balance-sense amplifying system. The standard mutual inductance balancer is replaced with an electronic balancer consisting of two type 1851 tubes so connected that with zero setting of the balancer both tubes are biased to cut-off. Tests were conducted to determine the following: (1) Whether the maximum phase shift introduced by the balance amplifier circuit is of sufficient magnitude to introduce inherent deviating influences or otherwise mitigate against satisfactory operation of such a device; (2) whether the additional noise level introduced by the balance amplifier seriously compromises the satisfactory operation of the equipment; (3) to determine by comparison methods any advantages or disadvantages over those of a standard model DP-9 direction finder; and (4) the changes or modifications that are desirable. The test findings and recommendations are contained in the report, together with schematic diagrams of the balance amplifier circuit and graphs. (a-3, b-3, c-1, d-1, e-0, f-Test)

1928. ANONYMOUS, "Phase Comparison Shipboard Direction Finders for Ultra-High Frequencies and Very High Frequencies," Federal Telecommunications Laboratories, Nutley, N.J., Proposal No. 238; 20 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1929. ROSS, W., "The Specification and Measurement of Polarization Errors in Adcock D/F's," National Physical Laboratory (British) Report: RRB/c.95; 21 March 1944. ABSTRACT: This paper is a critical review of the present position with regard to the specification and measurement of polarization errors in Adcock type direction finders. The respective merits of the "Standard Wave Error" introduced by Barfield and the "pick up ratio" for wanted and unwanted fields suggested by several other workers are examined. It is concluded and recommended that the former is to be used for Adcock direction finders erected not higher than about a quarter of a wavelength above ground while the latter is appropriate for more elevated systems. So far as measurements are concerned the problems involved in using a relatively nearby test transmitter are discussed in the light of recent advances in this field of measurement. It is pointed out that the performance of a direction finder is, in general, intimately bound up with the electrical properties of the site in which it is erected. (a-1, b-3, c-1, d-5, e-230, f-Analysis of error)

1930. CHRISTENSEN, J. W., "C2100D Airborne Direction Finder," Radio Research Laboratory Report No. 411-TM-61. See also Department of Commerce PB14131; 22 March 1944. ABSTRACT: This is a very brief description of the C2100D equipment in which three interchangeable antenna heads are used to give complete coverage from 100 to 450 mc. Photographs are included in the report. This report follows an earlier one dated 7 February 1944 which is believed to cover the equipment more thoroughly. (a-4, b-3, c-1, d-1, e-0, f-Manual)

1931. CHRISTENSEN, J. W., "The C2100 Airborne Direction Finder," Radio Research Laboratory Report No. 411-TM-61B. See also Department of Commerce PB14132; 22 March 1944. ABSTRACT: A description of a wiring change which decreases maximum selsyn error from 4 degrees to 1 degree. A schematic is included. Supplements PB14130. (a-3, b-3, c-1, d-1, e-0, f-Manual)

1932. ANONYMOUS, "Radio Set SCR-291-A," US War Department, Technical Manual No. 11-243; See also Department of Commerce PB-L80625; 24 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1933. BUSIGNIES, H., "Comparison between Ordinary Buried U Adcock and F. T. & R. Adcock Antenna Using the Horizontal U Connection," Federal Telecommunications Laboratories, Nutley, N. J. Technical Memorandum No. 76; 24 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-86, f-Adcock D/F)

1934. VON HANDEL, P. F., "Fundamental Problems of Direction Finding and Range Finding (Distance Measurements)," Department of Scientific Research and Experiment, Admiralty (British), Air Technical Report: Translation No. 299; 24 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1935. ANONYMOUS, "Handbook of Operating Instructions for Radio Compass AN/ARN-7," U.S. War and Navy Departments, Air Council of the United Kingdom: Report No. AN-08-30ARN7-2; 27 March 1944. See also Department of Commerce, PB14845. ABSTRACT: The Radio Compass AN/ARN-7 is an airborn navigational instrument. It utilizes signals transmitted from a range, commercial, or standard broadcast radio station to obtain directional or locational information. Under favorable conditions, stations up to 25 miles distance may provide the necessary signal to operate this equipment, depending on the power of the transmitting station. The radio compass operates from signals which are within the frequency range from 100 to 1750 kilocycles and is manually tuned by a remote control unit. The Radio compass AN/ARN-7 requires the following power supply: (1) 90 to 135 volts, 400 cycles alternating current at 0.7 to 1 ampere; (2) 28 volts direct current at 1.95 amperes. A 14-volt d.c. source can also be used if Rectifier Uniter RA-59-A is added to the installation. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

1936. ANONYMOUS, "Radio Set SCR-503-A," US Army, War Department, Technical Memo No. 11-246A; 30 March 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1937. ANONYMOUS, "Airborne Direction Finding Equipment Peil G6," (German: L.N.S.) See: Department of Commerce PB L71174; April 1944. ABSTRACT: Circuit diagrams and operation of this airborne direction finding equipment are described. (a-4, b-3, c-4, d-4, e-0, f-Description)

1938. ANONYMOUS, "AN/APA-17 Special Airborne Radio Equipment, Revision A," US Navy, Bureau of Aeronautics. See Department of Commerce PB37816; April 1944. ABSTRACT: Specifications are given for a direction finder equipment consisting of a rotating antenna,

an amplifier, and an indicator for use with an AN/APR-1 or similar receiver on naval or other military aircraft to permit relative bearings to be taken on sources of radar and radio signals. The equipment shall indicate each received signal as an antenna pattern on a CRT with distance from the center of the CRT screen representing magnitude of the signal, and position around the CRT representing relative bearing of the signal source. The equipment shall operate over a frequency range of 250 to 1,000 mc. (a-3, b-3, c-1, d-1, e-0, f-Specifications)

1939. ANONYMOUS, "AN/APA-24 Special Airborne Radio Equipment," US Navy, Bureau of Aeronautics. See Department of Commerce PB37839; April 1944. ABSTRACT: The equipment specified herein consists of low, medium and high frequency antenna assemblies together with their respective impedance matching switch units and associated components for use with suitable search receivers. The equipment shall operate with complete frequency coverage from 100 to approximately 400 megacycles, and shall be suitable for operation on naval or other military aircraft and shall permit relative bearings to be taken on sources of radio and radar signals. (a-3, b-3, c-1, d-1, e-0, f-Specifications)

1940. ANONYMOUS, "AN/ARD-3 Special Airborne Equipment, Revision A," US Navy, Bureau of Aeronautics. See Department of Commerce PB37815; April 1944. ABSTRACT: Specification of a complete direction finding equipment is given. This equipment shall be suitable for operation on naval or other military aircraft and shall permit relative bearings to be taken on sources of radio and radar signals. The equipment is to operate with complete frequency coverage from 350 to 400 megacycles, with suitable means provided for determining the polarization of the signals. (a-3, b-3, c-1, d-1, e-0, f-Specifications)

1941. BURGESS, R. E., "Aerial Characteristics," Wireless Eng., vol. 21, no. 247, pp. 154-160; April 1944. ABSTRACT: It is shown that impedance of aerial is same for reception as for transmission as consequence of its behavior as linear network, which permits application of Superposition Principle and Thevenin's Theorem; it is also shown by applying Reciprocal Theorem, that effective height and polar diagram are same in two conditions; four methods commonly used in calculation of aerial impedance are discussed; simplifying assumptions usually made in calculation of aerial impedance considered. (a-3, b-1, c-1, d-5, e-0, f-Theory)

1942. BUTTS, L. G., "Instructions for the Installation of Model DY-2 Radio Direction Finder Equipment, Range 2.5 to 30 Mcs," US Navy, Bureau of Ships. See Department of Commerce PB17491 April 1944. ABSTRACT: The model PY-2 high frequency direction finder is designed for taking radio bearings in the frequency range, from 2500 to 30,000 Kc, and is intended for permanent shore installation. This model uses the Adcock principle in its collector system. Adjustable length dipole antennas are carried on a horizontal arm, which also serves as the electrical shield for the transmission lines. The dipole system turns freely in azimuth from the operators position below. It may also be noted 90° (between horizontal and vertical). Instructions are given for adjustment operation and maintenance. Parts lists, wiring diagrams, schematics and photographs illustrate text. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1943. HOWES, F. S., AND WOOD, F. M., "Note on the Bearing Error and Sensitivity of a Loop Antenna in an Abnormally-Polarized Field," Proc. IRE, vol. 32, pp. 231-233, April 1944. ABSTRACT NO. 1: An expression is derived for the response of a loop antenna to a radio wave arriving at any angle with any linear polarization, and its application to D/F is discussed. Curves of loop bearing error and loop sensitivity, as functions of the angles of vertical incidence and polarization are given. ABSTRACT NO. 2: Polarization error equations are derived for a loop antenna in free space, hence the effect of the earth reflection is neglected. Complete expressions for polarization error including the effect of the earth reflection were derived by Terman and Pettit and published in the Proc. IRE, May 1945. (a_1-1, a_2-4, b-1, c-1, d-7, e-0, f-Theoretical analysis)

1944. LONSDALE, E. M., "Survey of Antenna Work of Radio Division at Naval Research Laboratory," 'A' Edition, RA3A214A, Naval Research Laboratory; April 1944. ABSTRACT: This is a summary of the results brought forth by investigations at the Naval Research Laboratory in the realm of Naval antennas. These investigations, which have been conducted by the various sections of the Radio Division, cover shipboard, aircraft, and submarine radiating systems in the frequency spectrum between 20 kc and 10,000 mc. Approximately fifty different antennas are discussed including communications, radar, countermeasures, and special purpose types. Whenever definite installation practices have been established, these are pointed out. In addition, a list of fifty NRL reports, grouped according to the aspect of the antenna problem with which they are concerned, is included as an appendix to this compilation. (a-1, b-3, c-1, d-1, e-164, f-Survey)

1945. MARCHAND, N., "Analysis of Balanced to Coaxial Transmission Line Conversion," Federal Telephone and Radio Corporation, Technical Memo No. 74; 4 April 1944. ABSTRACT: Several methods that can be used to convert either from balanced to coaxial or from coaxial to balanced circuits are discussed. The circuits are broken down into its impedance values, and the optimum values stated. (a-1, b-3, c-1, d-1, e-85, f-Computation)

1946. ANONYMOUS, "CXGH Direction Finder (Combination of Indications of a Radar System and the CXGG Type of Direction Finder for Identification Purposes)," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 246; 5 April 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1947. ANONYMOUS, "VHF/UHF Direction Finder for Naval Air Stations 225 to 390 Mc/s," Federal Telecommunications Laboratories, Nutley, New Jersey; 5 April 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1948. ANONYMOUS, "Signal Communication Equipment Directory: Radio Communication Equipment," U. S. Army, War Department, Technical Memo No. 11-227. See also Department of Commerce PB21936; 10 April 1944. ABSTRACT: This manual presents a condensation and compilation of data pertaining to Signal Corps radio communication equipment. Aircraft radio sets, fighter control sets, radio navigation sets, ground radio sets, radio intelligence and direction finding sets, and mine detectors are listed. For each set photographs, technical and tactical characteristics, and principal components are given. (a-3, b-3, c-1, d-1, e-0, f-Equipment directory)

1949. WILLIAMS, D. AND GUARINO, P. A., "Model DBC and DBC-1 Direction Finding Equipment," NRL Report No. R-2268; 10 April 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1950. THORN, D. A., HARRIS, R. J., AND WHIDDETT, S. D., "An Interception and D/F Receiver, Range 150 - 600 Mc/s, (Receiver WT 10)," General Post Office (British) Report, No. 1128; 11 April 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0).

1951. KIRCHMAYER, "Decimeter Direction Finding Receiver," (German) See: Field Information Agency, Technical, 677; Report No. 239; 18 April 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

1952. WIRKLER, W. H., "High Frequency Direction Finder with Automatic Bearing Indicator Frequency Range 2000 - 20,000 Kcs," Collins Radio Company, Cedar Rapids, Iowa, Report No. CDS 111; 28 April 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1953. THORN, D. A., ET AL., "An U.S.W. Field Array Polar Diagram and D. F. Survey, Case No. 2623," General Post Office (British) Report No. 1141; 29 April 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1954. ANONYMOUS, "Manual for Operation of Direction Finder Fu G 350 Z,"(German:O.L.G.)See: Air Document Index No. R2813 F1117; May 1944. ABSTRACT: Not available. (a-4, b-3, c-d, d-4, e-0, f-Instructions)

1955. BURGESS, R. E., "Reactance and Effective Height of Screened Loop Aerials," Wireless Engineer; May 1944. ABSTRACT: The paper constitutes an extension of the analysis of the screened loop aerial given in an earlier paper, and is based on the application of the transmission line equations with uniformly distributed constants. The conductors are assumed to be free from ohmic resistance, and the dielectric media are assumed to be loss-free. A symmetrical aerial with a single-turn loop conductor is considered, and the gap in the screen is taken to be narrow. There are two modes of propagation

corresponding to waves on the outside of the screen and to waves in the space between the loop and screen. The current and potential distributions on the loop and screen are determined when a given emf is applied to the loop terminals after reference to the boundary conditions at these terminals and at the gap. The inductance and capacitance coefficients can be expressed in terms of the geometrical dimensions of the system and of the dielectric constants of the media inside and outside the screen. The reactance, resonant and anti-resonant frequencies and self-capacitance are considered in detail for the loop in the balanced and unbalanced conditions for the case of the air-spaced loop, and the effect of a small capacitance across the gap is considered. The effective height of a square screened loop is calculated for transmission in the equatorial plane and its variation with frequency is found to follow closely that of the reactance for frequencies up to the first anti-resonance. A comparison is made of the current and potential distributions in the transmitting and receiving conditions. The paper concludes with an account of measurements of the reactance of a square loop of 150 cm side; fair agreement between theory and experiment is obtained and the general reasons for any discrepancy are mentioned. (a-1, b-1, c-1, d-5, e-43, f-Analysis)

1956. GRIFFITH, R. M. AND ROSINSKI, W., "Trials of D/F Outfit FV4 in H.M.S. 'Pretoria Castle' Between 124 and 145 Mc/s," Admiralty Signal Establishment (British) Report: M.616; May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Field test report)

1957. ROSINSKI, W., "Report on V.H/F D/F Trials of Outfit FV4 in H.M.S. Saltburn," Admiralty Signal Establishment (British) Report: M.615; May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Field test report)

1958. HORNER, F., "The Effect on the Sensitivity of a Rotating H Direction Finder (2.5 - 11.1 Metres) of Various Aerial-Receiver Couplings," National Physical Laboratory (British) Report: RRB/c. 98; 2 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1959. ANONYMOUS, "Handbook of Maintenance Instructions for Radio Sets SCR-575A and SCR-575B," Army Air Force: AN 16-40SCR-575-3 A.P. 2588A; 4 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

1960. ANONYMOUS, "Experimental Radio Compass Directed Automatic Flight Control Equipment," Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota, Report:DGCa-1; 5 May 1944. ABSTRACT: Not available (a-4, b-1, c-1, d-1, e-0, f-0)

1961. HARKNESS, "Compensation of Direction Finding Devices," Boeing Aircraft Company, Seattle, Washington, Report WD-12425; 5 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1962. ANONYMOUS, "Radio - Direction Finders - Design of Model DAV-2 Radio Direction Finder- Final Report on," NRL Letter Report No. e-567/69(342MS); 8 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1963. HANSEL, P.G., "Radio Set AN/CRD-2 (Formerly Called Set SCR-502-T2)," Signal Corps Engineering Laboratory, Eatontown: Engineering Memo No. ST-5, 10 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

1964. ANONYMOUS, "Translation of Captured Japanese Documents," Joint Intelligence, Control Pacific Ocean Area: Item 8499; 12 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Translation)

1965. ANONYMOUS, "Radio Direction Finders for Marine Corps Reconnaissance Cars (1.5 - 160 Mc/s)," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 237; 13 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

1966. WELLER, H., "Location Method by Self-Heterodyned Pulses," (German: D.F.S.) See: Department of Commerce PB L60639, 14 May 1944. ABSTRACT: For purposes of orientation a pulse procedure is proposed which permits an electric location determination of extraordinary accuracy and greatest simplicity by the use of self-heterodyning and delay elements. First, the directional beam method with receiver-controlled selection of the directional beam on which the location method is based, is explained, and then the possibilities of bearing determination are briefly discussed. The double application of this directional beam method finally leads to the location method by pulses which will be discussed in the light of obtainable accuracy, possibility of practical application, and necessary expenditures. The conclusion is reached that the proposed location by pulses possesses considerable advantages over present location methods by radio navigation. Diagrams and graphs are included. (a-3, b-3, c-4, d-4, e-0, f-0)

1967. ANONYMOUS, "Direction Finder for Airplanes, Ships and Ground Use (100 - 300 Mc/s Scanning Type)," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 243; 15 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1968. ANONYMOUS, "Radio-Direction Finding-High Frequency Direction Finder Trailer - Interim Report on," NRL Letter Report No. C-567/69(342f); 16 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1969. ANONYMOUS, "Radio - Direction Finding - Bureau of Ships Problem S380,.1R-C - Test of Direction Finder Calibrating Usefulness of Model TCZ Transmitter for Model DAK Series Direction Finders - Final Report on," NRL Letter Report No. C-567/69(342:MGC); 17 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1970. ANONYMOUS, "Radio - Direction Finding - High Frequency Pre-Production Model X-DAV, Serial No. 2, F.T. & R. Corps., Newark, New Jersey, Contractor Contract C-NSss-33087 - BuShips Problem S644T-C-Final Report of Tests on," NRL Letter Report No. C-567/69(342:EB), 17 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1971. ANONYMOUS, "Radio - Direction Finding - Model DAK-1 Medium Frequency Direction Finder - Pilot Installation of in USS Coolbaugh-Enclosures to Report on - Forwarding of," NRL Letter Report No. C-567/69 (342:FTC)," 18 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1972. ANONYMOUS, "Translations of Captured Japanese Documents," Joint Intelligence, Central Pacific Ocean Area: Item No. 5062; 19 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-6, e-0, f-Translations)

1973. CHRISTENSEN, J. W., "The C2100 Airborne Direction Finder," Radio Research Laboratory: Technical Manual No. 411-TM-61B; 23 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Manual)

1974. ANONYMOUS, "Report on Sense Balancing and Calibration of D/F Outfit RH2 in HMS Scyllu," Admiralty Signal Establishment (British);25 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1975. KUCK, B. M., "Test Report (Field Division) C-1900 Tail Attachment," Radio Research Laboratory:Test Report No. 411-TR-12; 25 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

1976. ANONYMOUS, "Radio - Model DAK D/F Equipment - Shipboard Location of Collector System - Midship Sites on AM324 (AM57 Class) - BuShips Problem D22 CD," Navy Radio and Sound Laboratory (Now Naval Electronics Laboratory); 29 May 1944. See also NRL Report: RS 061284. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1977. ANONYMOUS, "VHF/UHF Direction Finder for Naval Air Stations and Ships 225 to 390 Mc/s," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 255; 29 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-This proposal replaces proposal 244)

1978. STRONG, C. E., "Automatic V.H.F. Direction Finder," Standard Telephone and Cables, Ltd. (British) Technical Report: No. 32;

30 May 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

1979. DORNE, A. ET AL., "Instruction Book for M2300 H.F. Direction Finder for Aircraft," Radio Research Laboratory Instruction Book No. 411-Ib-17. See also Department of Commerce PB14422; 31 May 1944. ABSTRACT: The M-2300 is a Direction Finding System for signals with range from 300 to 900 mc with possible use in the ranges from 250 to 300 mc, and from 900 to 1000 mc. It indicates the direction from which the signal is received and its polarization. The equipment is designed to be used in conjunction with the AN/APR-1 receiving equipment. Sections in this instruction book give information on the description, operating procedure, maintenance and repair, and installation of the M-2300. Photographs, parts lists and a schematic diagram are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1980. ANONYMOUS, "Cathode Ray Direction Finding (C.R.D.F.)," Air Ministry (British) Report No. S.D. 0172-A; June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1981. ANONYMOUS, "Direction Finding on Multiple Ray Morse Signals, Final Report (Quench Morse Selector), Great Baddow Research Lab. Marconi W/T Co.," Admiralty Signal Establishment (British) Report M.623; June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

1982. ANONYMOUS, "German Control of Fighters by the Benit and Egon Methods," Air Ministry (British) Report No. A.S.I.R.: 25; June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1983. ANONYMOUS, "Handbook of Maintenance Instructions for Model AN/ARD-3 Direction Finder System," US War and Navy Departments, Air Council for the United Kingdom, Report No. AN-16-30ARD3-3. See also Department of Commerce PB14937; June 1944. ABSTRACT: The D/F equipment covered in this handbook may be used for homing or direction finding. It is airborne equipment using an intercepted signal ranging from 350 to 400 megacycles. The null position is indicated by an autosyne system. The complete equipment weighs 80 pounds. A general description of the component parts, and procedures for installation and adjustment, operation, and maintenance are given. A discussion of the theory of operation, supplementary data on vacuum tube parts characteristics, and a table of replaceable parts is included. Numerous illustrations include photographs, drawings, wiring diagrams, and flight patterns. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

1984. ANONYMOUS, "Signal Communication Equipment Directory: German Radio Communication Equipment," US War Department, Report No. TME-11-227. See also Department of Commerce Report No. PB L30630; June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Directory)

1985. DWYER, R. J., "The Directional Characteristic of a Half-Wave Doublet Goniometer," J. Appl. Phys., vol. 15, pp. 513-514; June 1944. See also Wireless Engineer, vol. 21, p. 541; November 1944. ABSTRACT: The directional characteristic of a goniometer using two half-wave doublet antennas mounted at right angles is derived. It is shown that, unlike the double loop goniometer, the directional characteristic is not identical with that of a single half-wave doublet that can be rotated, though the variation from such a case is very small. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

1986. HROMADA, J. C., AND KING, P. B., "Development of Ultra-High Frequency Radio Range. Pt. I: Ultra-High Frequency Radio Range," U.S. Civil Aeronautics Administration, Technical Development Report No. 42; June 1944. ABSTRACT: Description of series of aural radio range experiments conducted at frequencies of 63 and 125 megacycles; results of numerous ground and flight tests using vertical and horizontal antennas are discussed. (a-3, b-3, c-1, d-1, e-0, f-Navigational aids)

1987. KING, R., AND HARRISON, C. W., "Mutual and Self-Impedance for Coupled Antennas," J. Appl. Phys., vol. 15, pp. 481-495; June 1944. ABSTRACT: A general theory for the current in coupled antennas is formulated in terms of the vector potential and applied to determine the self-impedance Z_{s1} and the mutual impedance Z_{12} of a center-driven antenna in the presence of a second parallel, identical antenna which may be center-driven or center-loaded in an arbitrary way. Each antenna has a half-length h, a radius a, and the distance between them is b. Curves are shown for Z_{s1} and Z_{12} for $h = \lambda/4$; $\Omega = 2 \ln(2h/a) = \infty$, 30, 20, 10; $0.05 \leqq b/\lambda \leqq 0.4$; and for $h = \lambda/2$; $\Omega = 2 \ln(2h/a) = 30$, 20, 10; $0.05 \leqq b/\lambda \leqq 0.5$. It is shown that except for the special case of an indefinitely thin antenna ($\Omega = \infty$) the self impedance Z_{s1} of an antenna in the presence of a second antenna differs from the self-impedance Z_0 when the antenna is isolated and varies with b/λ. The input impedance Z_{1in} is determined and plotted for the same values of h and Ω, and the same ranges of b/λ for the following special cases: 1. The antennas are both center-driven in phase by identical generators. 2. The antennas are both center-driven in opposite phase by identical generators; or a driven antenna is parallel to a perfectly conducting plane. 3. Antenna 1 is center-driven; antenna 2 is parasitic and unloaded. 4. Antenna 1 is center-driven, antenna 2 is parasitic and center-tuned to self-resonance ($h = \lambda/2$ only). (a-1, b-1, c-1, d-1, e-0, f-Theory)

1988. MACKINTOSH, J. E., "The Effect of Balloon Barrage on V.H.F. Communications and V.H.F. D/F," Royal Aircraft Establishment, Ministry of Aircraft Production (British) Technical Note No. RAD-138; June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1989. STRUSZYNSKI, W., REDGMENT, P. G., AND WALDEN, D. E., "Injection of Sense and Loop Signal for Testing H/F D/F Outfits," Admiralty Signal Establishment (British) Report: M-470; June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1990. ANONYMOUS, "C-2100-E Direction Finding Systems, Revised see 2100-D with added Antenna Head and Balun," Radio Research Laboratory, Transitional Memorandum No. 411-TMR-63F; 1 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1991. ANONYMOUS, "H/F D/F Outfit FV4," NRL Report No. 001-5159; 7 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1992. ANONYMOUS, "Program of Demonstration of Direction Finder Developments - F.T. & R. Great River Field Station," Federal Telephone and Radio Corporation, New York City, Report No. 1458-1; 13 June 1944. ABSTRACT: List of Army, Navy, and NDRC equipment demonstrated on above date. (a-4, b-3, c-1, d-1, e-0, f-0)

1993. ANONYMOUS, "Radio - Direction Finding - High Frequency Preproduction Model X-DAV, Serial No. 2 -T.T. & R. Corp., Newark, New Jersey, Contractor - Contract C-NXss-33087 - BuShips Problem S644T-C, Supplementary Report of Type Tests Conducted at F. T. & R. Factory," NRL Letter Report No. C-S67/69 (342g). 13 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

1994. ANONYMOUS, "Air Ministry Signals Bulletin to June 15th, 1944," Air Ministry (British) Report No.: Signals Bulletin; 15 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

1995. FRANZ, K., "Aerials," Electrotech. Zeit., vol. 65, pp. 229-233; 15 June 1944. ABSTRACT: A review of physical principles and developments with special reference to the directional properties and impedance of various aerial arrays. (a-6, b-1, c-4, d-4, e-0, f-Survey)

1996. ANONYMOUS, "British Direction Keeping by Wireless Keeping," USN N.A.R. Cairo: 6469-44; 17 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-[illegible], e-0, f-0)

1997. HAMMETT, R. L., AND WRIGHTSON, F. M., "Tests of the AN/APA-24 (C2100) Airborne Direction Finding Equipment," Radio Research Laboratory Technical Memo No. 411-TM-61C. See also Department of Commerce PB14133; 21 June 1944. ABSTRACT: A report on field tests and a number of operationally pertinent laboratory tests on the C2100 D/F system. The laboratory tests are discussed with regard to the frequency range over which any one antenna may be employed. Conclusions are reached with respect to mounting position, use of ground tests, systematic errors, operational conditions, testing and operation of the equipment. A diagram of azimuthal patterns is included. Four different antenna heads are used in this system which covers the frequency range of 100 to 750 mc. (a-3, b-3, c-1,

d-1, e-0, f-Test)

1998. ANONYMOUS, "Experience with Direction Finding Equipment and Considerations Which Should Affect Future Developme t," Army Air Force, Allied Air Forces, Headquarters, Mediterranean: NRL Report: RS 008704; 22 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1999. ANONYMOUS, "Radio - Direction Finding - Medium Frequency Model DAK-2 Serial Numbers 4 and 13 - Installation of an USS KIMMEL (DE584) and USS RILEY (DE579)," NRL Letter Report: C-567/69 (342 b); 23 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2000. ANONYMOUS, "Radio - Direction Finding - Model DAK-1 Medium Frequency - Direction Finder Calibration of USS NEW YORK - Report on," NRL Letter Report: C-S67/69 (342 b); 26 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f- Report)

2001. KRAUS, J. D., CLARK, H. K., AND MORGAN, A. N., "Preliminary Instruction Book for M2600 Direction Finding Equipment (Navy Model CSGA-1)," Radio Research Laboratory, Instruction Book No. 411-IB-38. See also Department of Commerce PB14448; 26 June 1944. ABSTRACT: M2600 is a system which is used to determine the direction and polarization of radar and communication signals. The frequency range within which this system operates depends on the antenna which is used in connection with it. This book contains a full description of all its parts and functions, and gives instructions in regard to its operation, maintenance, repair and adjustments. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2002. ANONYMOUS, "Instruction for Installation and Operation of Collins Type 115K-3 Audio Filter Unit with Navy Model DAB Series Equipment," Collins Radio Company, Cedar Rapids, Iowa; 29 June 1944. See also Department of Commerce PB17486. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2003. ANONYMOUS, "Radio - Direction Finding - High Frequency Direction Finder, Model DAQ, Serial #88 - Report of Inspection and of Shipboard Installation on USS CROATAN (CVE-25)," NRL Letter Report No. C-S67/69(342:MJS); 30 June 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2004. KENDRICK, G. W., "Report on D/F Measurements Research," Final Report on D/F Project Contractor No. OEMsr-1101 (OSRD 4528) Contractor, Univ. of Puerto Rico, Rio Piedras, Puerto Rico; 30 June 1944. ABSTRACT: This report describes work carried out in Puerto Rico during the fiscal year 1943-44. This work included the selection and preparation of a site for the operation of a Navy type DAB D/F, the construction of the building and associated power facilities, the assembly, testing and calibration of the equipment and the initiation of consistent observations on the direction of arrival of high frequency signals. Problems incident to the search for a suitable location are discussed and pictures are provided of the site chosen. Corresponding details are given with regard to similar observations made in Switzerland between Berne and Basle. A description follows of demonstrations of the mountain effect on a reduced scale by means of an ultra-short wave direction finder and a system of reflectors. Further, the observation of the "cone of silence," as well as the detection of flight above a station (broadcasting or radio beacon) by means of a radio direction finder or a radio compass is discussed. The paper concludes with remarks on the advantages of the radio compass and radio beacon combination as shown, for example, by the results of tests made in the United States. (a-4, b-3, c-1, d-1, e-151, f-Report)

2005. ANONYMOUS, "Description and Maintenance Instructions for the Dead Reckoning Box for a Housing Receiver EZ 2," (German) See: Air Document Index No. R2266 F17; July 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Description)

2006. ANONYMOUS, "Direction Finder Fu Peil A 100 a 1, Mobile," Air Document Index No. R2266 F17; July 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0).

2007. ANONYMOUS, "Model DBB Hand-Controlled Ultra-High-Frequency Radio Direction Finder Equipment Frequency Range: 90 Mc-3000 Mc," Federal Telephone and Radio Corporation, New York City, Development Report No. 84; July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2008. ANGEL, "Remote Control of Fi 103," (German) See: Air Document Index No. R4007 F618-627; July 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2009. BOOTH, W. S., "Technical Data on Japanese Radio and Radar Equipment: Edition A," NRL Report No. RA-3A-215A. See also Department of Commerce PB49844; July 1944. ABSTRACT: This report gives brief technical data of known Japanese radio and radar equipment compiled from the technical examination, at home and overseas, of captured electronic material. Photographs are included in the report. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2010. GROSSKOFT, J., AND VOGT, K., "The Influence of Heterogeneous Ground on Radio Compass Calibration," (German: F.D.R.) See: Air Document Index No. R V-119 F; July 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Study)

2011. KING, P. B., AND KOUCHNERKAVICH, T. A., "Development of High-Frequency Radio Range. Pt. II: Testing of Ultra-High-Frequency Radio Ranges on Towers," U. S. Civil Aeronautics Administration Technical Report No. 43; July 1944. ABSTRACT: Further developments of ultra-high frequency radio range; factors affecting usefulness of radio ranges from theoretical standpoint; effect of reflections from ground and from counterpoise; effect of height on distance range and continuity of signal; apparatus used; data obtained at Indianapolis, Indiana, and Van Nuys, California, during latter part of 1941. (a-3, b-3, c-1, d-1, e-0, f-Navigational aids)

2012. MACKINTOSH, J. E., "D/F Aerial System, Types 60A and 61A for Use Over 100-156 Mc/s," Royal Aircraft Establishment, Ministry of Aircraft Production (British) Technical Note No. RAD 225; July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2013. ANONYMOUS, "Short Range Navigational System," Federal Telephone and Radio Corporation, Newark, New Jersey, Proposal No. 265; 3 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2014. THIAS, E. P., "Radio Set SCR-613-T3," Signal Corps, Engineering Laboratory, Evans, Report No. ST-12, (Coles: D/F Group); 4 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2015. GUARINO, P. A., "Models DBB and CXGA Direction Finding Equipment," USN, NRL Report No. R-2327; 10 July 1944. See also Department of Commerce PB120748. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2016. ANONYMOUS, "Radio Direction Finder Station Bayeux, France," USN, NRL Report: RS 008587 and RS 008918; 13 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2017. BARKOFSKY, E., AND MIZEN, C., "M3000 Direction Finding Equipment for Airborne Use - Preliminary Instruction Book," Radio Research Laboratory, Instruction Book No. 411-IB-28. See also Department of Commerce PB14435; 14 July 1944. ABSTRACT: This instruction book discusses the installation, operation, and maintenance of the M3000 direction finding equipment. This equipment, designed for airborne use, is used to determine the direction of radio and radar signal source in the frequency range of 250 to 1000 megacycles. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2018. MIMNO, H. R., "Correlation of Direction Finder Errors with Ionospheric Measurements," Harvard University, Office of Scientific Research and Development (OSRD) Report No. 3981, NRL Report No. RS 21468. See also Department of Commerce PB L87780; 15 July 1944. ABSTRACT: In the preparatory phases of the research, a standard Navy type DAB direction finder has been installed in a special building constructed for the purpose. Necessary preparations have also been made for conducting sweep-frequency ionospheric observations in addition to our normal multifrequency program. (a-3, b-3, c-1, d-1, e-0, f-Study)

2019. HELLIWELL, R. A., "Correlation of Direction Finder Errors with Ionospheric Measurements," Stanford University, Palo Alto, OSRD 3982; 18 July 1944. See also NRL Report RS 21469. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See preceding abstract)

2020. ANONYMOUS, "Development of a New Receiver-Indicator Unit for Type DAU Direction Finder," Federal Telephone and Radio Corp., N.Y.C., Proposal No. 279; 19 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2021. ANONYMOUS, "Development of a New Wave Collector for Type DAQ or DAU Direction Finder," Federal Telephone and Radio Corp., N.Y.C., Proposal No. 268; 19 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2022. ANONYMOUS, "Radio-Direction Finders - Captured Japanese High Frequency Equipment Type 93, Revision Serial 263, Japanese Naval Technical Research Institute Manufacturer - BuShips Problem S148.6R-S - Final Report on," NRL Letter No. S-S67/69(342:PS); 19 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2023. FOSTER, D., "Theory and Applications of Loop Antennas," Radio Research Laboratory, Technical Memo No. 411-TM-123. See also Department of Commerce PB14037; 22 July 1944. ABSTRACT: General formulas for calculating the radiation from antennas in the form of large polygonal loops. Travelling current waves, standing waves, and uniform current are considered and the solution of the problem of the circular antenna with uniform current is treated in detail. Possibility is suggested that the directivity pattern and polarization characteristic of some loop antennas may also be obtained by means of wave guides terminated by horns of proper shape. Equations for the current moment are given, which lead to expressions for the field intensities, the radiation intensity and other properties. Eleven graphs and drawings are included. (a-3, b-3, c-1, d-1, e-0, f-Description)

2024. ANONYMOUS, "Puget Sound Navy Yard, Washington, Capacity-Coupled Balance Unit for Model DP Series Medium Frequency Radio Direction Finder," NRL Letter Report No. RA 23A 511A; 27 July 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification)

2025. BLODGETT, E. D., AND LAKATOS, L. L., "Ultra-High Frequency Direction Finding Study," Radio Corporation of America, Camden, New Jersey, Project No. 13.1-82, OSRD Report No. 4285. See also Department of Commerce PB L87768; 29 July 1944. ABSTRACT: A comprehensive investigation of two general types of directive arrays, for use in the VHF and UHF bands (150-600 mc/s), was carried out in this project, with emphasis on factors of importance in direction finding. The two types were selected on the basis of comparisons between arrays in use on direction finders, and other arrays used in certain closely related applications. The first type uses two arrays of identical directivity, associated with two reflectors the latter being placed at an angle so as to displace in azimuth the response pattern of one with respect to the other. Amplitude comparison of the outputs of the two arrays enables the bearing of an arriving signal to be determined at the equisignal point. Two systems of this general type were studied, one having a single dipole placed before each reflector; the second, two dipoles referred to hereinafter as the V-1 and V-2 arrays respectively. Both were found capable of satisfactory direction finding, however, the first is subject to higher polarization errors. When amplitude comparison is made by means of a differential connection between the two arrays and the resulting null then used for bearing indication, the polarization errors of both the V-1 and V-2 are low. The second type considered (flat array) is an array mounted before a flat screen, with lobe displacement accomplished electrically. This type was found satisfactory with one exception. At the upper end of the frequency range covered, it is possible to obtain two false bearing indications, one on either side of the true bearing. These may, however, be readily distinguished either in manual operation, or with oscilloscopic indicators. They may be troublesome when automatic tracking is used. It is considered that further development on this type may remove this difficulty. The relative merits of the V and Flat arrays are, briefly, that the V is more uniform in performance but is larger in size; the impedance characteristics of the Flat array are exceptionally good for the wide frequency range covered, but the component electrical elements must be more carefully chosen. Certain related subjects were investigated in the course of the work. A satisfactory transformer for converting from a balanced to an unbalanced system was designed. A recently proposed method for evaluating polarization errors was put in use, and was found to be superior to other available methods. A new method was developed for the measurement of the electrical constants of ground. Impedance characteristics of cylindrical dipoles of large transverse dimensions were studied. The differentially connected V array was found to have certain advantages over the conventional elevated H Adcock. Work done under Contract OEMsr-1909 by Radio Corporation of America, Camden, New Jersey. (a-3, b-3, c-1, d-1, e-0, f-Study)

2026. POAST, L. M., "Coordinated Study of Correlation of High Frequency Direction Finder Errors with Ionospheric Conditions," US Bureau of Standards: Project No. 13.2-92. See also Department of Commerce Publications PB L62740 through PB L62751; 31 July 1944. ABSTRACT: These reports, (IRPL-G series), issued bimonthly, describe the progress of the work at the National Bureau of Standards and four cooperating laboratories (Stanford University, Calif., Harvard University, Mass., University of Puerto Rico, P. R., and Carnegie Institute of Washington, Alaska) on the effects of ionospheric conditions on direction-finder indications. The work is a continuation of that done by the Bureau of Standards under NDRC project, terminated in June 1944. In this report direction-finder data in the form of bearing observations on fixed stations made by the several laboratories are analyzed and correlation of errors with ionospheric conditions are determined. Separate reports from each of the cooperating laboratories are also included. (a-3, b-3, c-1, d-1, e-791, f-Study)

2027. ANONYMOUS, "C.R.D.F. Line-Up Oscillator," Air Ministry (British), Report: S.D. 01728; August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2028. ANONYMOUS, "D.F. Stations, Mobile, B/C Nos. 1 and 2," War Office (British), Report No. ZA 24167; August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2029. ANONYMOUS, "German Direction Finder, EP2a, Mfg. 1940," Signal Corps, Enemy Equipment Intelligence Service Report No. 8-5; See also Department of Commerce PB19732; August 1944. ABSTRACT: This set when found was without the antennas. It is almost identical in design to German D/F Receiver L. Mw. /24b-315. The circuit is identical except for the addition of a switch used to disconnect the loop antennas so the set uses only the sense antenna for signal pickup. A circuit diagram and 8 photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2030. ANONYMOUS, "Instructions for Dot Lock Direction Finding Receiver," Don Lee Broadcasting System, Hollywood, California; August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2031. ANONYMOUS, "Pre-Preliminary Instruction Book Radio Set SCR-551-T5," Federal Telephone and Radio Corporation, Newark, New Jersey; August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2032. CARTER, P. S., "Antenna Pattern Measurements," Radio Corporation of America, Camden, New Jersey, Report No. CM-45-9; August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Measurements)

2033. HROMADA, J. C., "The Development of a New Station Location or Z-Marker Antenna System," Proc. IRE, vol. 32, pp. 454-463; August 1944. ABSTRACT NO. 1: This paper presents descriptive and flight-test information relating to a new type Z-marker antenna system which possesses a number of marked advantages and improvements over that used at present Z markers. The antenna consists of two spaced-dipole arrays, crossed at right angles to each other, and excited in quadrature time phase. The design of the arrays is based on the principle of proportioning dipole currents in accordance with the coefficients of the successive terms of the binomial expansion. The antenna is of simple and rugged design, capable of maintaining a high degree of marker-zone stability under rain, snow, and sleet conditions, and lending itself to prefabrication in units and sections of transmission line for ease in field installation. The marker zone is considerably narrower than the zone provided by present Z markers and is ideally suited to instrument approaches. Whereas the height of present Z markers is limited to about 10,000 feet, the new marker

antenna may readily be extended to over 20,000 feet altitude with present transmitting equipment. Pilots have, heretofore, noted the apparent excessive broadening of the marker zone during flights off-course or on flights over the radio range at a large crab angle. This effect is greatly reduced with the new antenna, making it possible for the pilot to obtain a more accurate fix on the range station. ABSTRACT NO. 2: The aerial consists of 2 spaced-dipole arrays, crossed at right angles to each other, and excited in quadrature time phase. The design of the arrays is based on the principle of proportioning dipole currents in accordance with the coefficients of the successive terms of the binomial expansion. The aerial is capable of maintaining a high degree of marker-zone stability under rain, snow, and sleet conditions, and lending itself to prefabrication in units and sections of transmission line. The marker zone is considerably narrower than the zone provided by present Z-markers and is ideally suited to instrument approaches; it may readily be extended to over 20,000 feet altitude with present transmitting equipments. (a_1-1, a_2-3, b-1, c-1, d-1, e-0, f-Descriptive evaluation)

2034. LOESSEN, "Unipolar Main Circuit for the E-Compass Installation,"(German: Fr. Yacht U. Bootswerft, Bremen). See Department of Commerce PB L88952; August 1944. ABSTRACT: Report consists of 2 pages of wiring diagrams. (a-3, b-3, c-4, d-4, e-0, f-Instructions)

2035. McKEE, C. W., "Pre-flight Installation Tests of Automatic Radio Compasses," Communications, vol. 24, p. 33; August 1944. ABSTRACT: This paper describes procedures used to make an overall check of an automatic radio compass installation aboard a plane. Procedures are given to obviate ground effects and simulate in-flight conditions. (a-6, b-2, c-1, d-1, e-0, f-Descriptive analysis)

2036. POAST, L. M., "Coordinated Study of Correlation of High-Frequency Direction-Finder Errors with Ionospheric Conditions," Office of Scientific Research and Development (OSRD) Report No. 4286. See also Department of Commerce PB L88024. See also Abstract No. 2026 bearing same title dated 31 July 1944; August 1944. ABSTRACT: The study of the correlation of direction-finder errors with causative ionospheric conditions was carried on by five cooperating laboratories. These were the National Bureau of Standards receiving station at Sterling, Va., near Washington, D. C., the College, Alaska, Observatory of the Department of Terrestrial Magnetism, Carnegie Institution of Washington; Stanford University, California; University of Puerto Rico; and Harvard University, Cambridge, Massachusetts. The National Bureau of Standards served as the centralizing agency. Measurements were made on a large number of stations distributed in azimuth, distance, and frequency. The results obtained on approximately 30 representative stations dealt with in the report show relationships of bearing errors to field intensities, maximum usable frequencies and skip distances, geomagnetic disturbances, absorption, and transmitter antenna directivity. Mention is also made of effects of sporadic-E, scattering, and sudden ionosphere disturbances. The results demonstrate that deviations, often in excess of 50 degrees, occur on transmissions received at the NBS direction-finder site from stations location in England and Germany. The influence of the auroral absorption zone on bearing accuracy over these paths is analyzed, and indicates that the steep gradient of absorption between paths passing near and through the zone reasonably accounts for the effects. Correlation was found between bearing errors and field intensities, the large errors occurring when field intensities are relatively weak. Considerable evidence that large errors may be predicted at times when the muf fell below the operating frequency was also obtained. Simultaneous occurrences of large errors and severe geomagnetic disturbances were observed on the Berlin-Sterling path and on the Daventry-Sterling path. Only slight evidence of geomagnetic disturbances on bearing accuracy for paths other than those passing near or through the auroral zones was discovered. (a-3, b-3, c-1, d-1, e-791, f-Study)

2037. ALLISON, JOHN L., "Developments of British Naval Direction Finding," Technical Report issuedby OSRD, D/F Section, Division 13, National Defense Research Committee; August 5, 1944. ABSTRACT: A survey of British direction finding research activities was conducted immediately prior to publication. The report describes various British direction finders including (1) Description of HFDF Equipment in use at the time of the report. These equipments were a goniometer operated FH3 and a twin channel receiver operated FH4 crossed loops. (2) Masthead Adcocks which were rejected because of narrow bandwidth, low sensitivity and other difficulties. (3) A goniometer FH3 as an alternate to the FH4 in order to obtain rapid frequency tuning. It is concluded that the goniometer aural null arrangement is satisfactory only with a skilled operator. (4) The FH4 with the Plessey twin channel receiver for which it is claimed that the phase and amplitude balance had been reduced to 30 seconds. Most instantaneous D/F installations in Great Britian make use of the twin channel rather than the spinning goniometer on the basis of the following advantages: (a) Two signals on the same frequency indicate their respective bearings from the directions of the sides of the resulting parallelogram on the CR tube. (b) There is no keying rate break up of the pattern as in the case of goniometer systems. (c) The signal may be monitored without tone modulation from the goniometer. (d) There is no shift or bearing due to IF ringing when very narrow bandwidth is employed. (e) Dot-locking is easily applied. The disadvantage of complicated design is high precision in manufacture and frequent necessity of calibration was stated. The advantage of continuous injection of twin channel receiver such as the SCR-501 is mentioned. A simple method of AVC controlled amplitude balance with some loss in sensitivity is mentioned. The FH4 has only one tuned circuit per IF transformer to simplify amplitude and phase matching. (5) A range estimation feature is described for the FH3 and FH4. This functioned on the basis of assumed radiated powers for German submarines. (6) The FH5 twin channel receiver which is automatically calibrated is described. An injection oscillator operates for one-half cycle of a 22 cycle per second switching frequency. During the half cycle when the signal is being received, the set functions as a conventional twin channel receiver and during the other half cycle the injection oscillator which is nominally of the same frequency as the wanted signal is fed into the input of the two channels and actuates phase and amplitude controls which are dependent on a phase discriminator and differential amplitude detector circuits. A problem in the development of this system is the provision of an injection oscillator with sufficient attenuation or dynamic range. It is estimated that 120 db of attenuation was necessary. A second problem was obtaining an injection frequency exactly the same as the incoming signal. These problems in the report are stated in language which indicate that they had not been solved at the time of writing. (7) A system to avoid sky wave errors in the crossed loops HFDF designated the RH2 was described. Following masthead Adcock experiments which led to negative conclusions, spaced loop experiments were initiated in the hope of finding suitable performance locations near the deck. A spaced loop developed by N. P. L. and described in RRB/C34 was developed by A. S. E. The loops are simply cross connected and tuned by a single condenser. This antenna was found successful in three experimental installations which were in use for several months. This spaced loop operated within the range of 2.5 to 18 mc and had certain column resonances within that range which presented problems. A vertical sense antenna was mounted between the loops. The loops were 3-1/2 ft squareand 3-1/2 ft apart, yet the sensitivity equaled to or was better than that of the FH4. The report states that the system was satisfactorily tested and that the equipment was being placed in production for installation in British capital ships. The report emphasizes that certain polarization errors would probably occur due to the limited area of the flat-roof of the D/F office on which a downcoming polarized wave could induce circulating currents. However, compared with a crossed loops such a polarization error would be small. The accuracy of the bearings of this spaced loop was found good at all azimuths except in a sector astern. The Marconi Company was not in agreement as to the practicability of producing in quantity such a spaced loop. R. J. Kemp of Marconi concluded that the cross connected spaced loop was too critical as regards to mechanical dimensions. (8) Equipments described as FM11 and FM12 were described as standardaural null direction finders for submarine and surface craft with crossed loop antennas in the frequency ranges of 15 to 500 kcs for the FM11 and 42 to 1000 kcs for the FM12. (9) An equipment designated FV1 which was an amplitude comparison system using four antennas covering four quadrants was discontinued as a result of unsatisfactory tests. (10) An equipment designated FV3 operating between 37 and 50 mcs was developed to encounter the E-boat. (11) An equipment designated the FV7 was described in terms of improvement over the FV3 for the range of 30 to 100 mc. It was described as a crossed H pair of thick dipole elements. (12) An equipment designated FV4 thin dipole crossed H Adcock using an inductive goniometer from 100 to 124 mc with later modifications to operate to 153 mc was mentioned. (13) An equipment designated FV5 was described as being designed for the top mast of an aircraft carrier although also applicable to both installations. This equipment used an electronic goniometer. Various advantages and disadvantages of the electronic goniometer are described. (14) An RAF mobile spaced loop was described and also designated as the RH2. This equipment operated from 2.5 to 12 mc, has 8 ft spacing and contains two 4 ft loops which collapse flat when not in use. The report states that this equipment demonstrated better sensitivity than the SCR-291. It is also mentioned that a redesign of this spaced loop permitted the use of a CRT indicator. This equipment was claimed to be in production with the range of 2.5 to 20 mc. (15) A spinning goniometer D/F by the Marconi Company was also described. This equipment had a novel modulation scheme and a saw tooth wave display with certain advantages claimed. (16) A group station D/F system is described in connection with Heiligtag effect. Various error improvements are listed although the improvements were not as extensive as expected. (17) Mention is made of a D/F being developed for the range of 3000 to 6000 mc. (18) A navigational type equipment

called a transit D/F is described in some detail. The system appears to be cooperative. (19) An equipment to correct for ionospheric disturbances is described. (20) A dot-lock D/F system is described. (a-4, b-3, c-1, d-5, e-269, f-Review and description of equipments)

2038. ANONYMOUS, "Operational Test of Carrier Level Indicator Applique Fit for VHF D/F Bearings," Army Air Force: Board Project No. (M-2) 58; 8 August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2039. ANONYMOUS, "Amendments to C. B. 4333 Handbook for D/F Outfit FF4," Admiralty (British); 10 August 1944. See also NRL: RS 019367. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Equipment handbook amendments)

2040. CHENEY, M. G., "Measurement of Ground Constants by Wave Tilt, Using Horizontal Polarization," NRL Report No. R-2346; 10 August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2041. ANONYMOUS, "Flight Test of Prototype Conversion of MN-26C Radio Compass Equipment to NM-31C Radio Compass Equipment (ADF) in PV-1 Airplane No. 34733 NA83/F42-1/7/PV-1," Naval Air Station, Patuxent NRL Report RS 019301; 11 August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2042. NOE, J. D., "Report of Prototype Installation and Tests of AN/APA-17 Antenna in a B-17 Aircraft," Radio Research Laboratory: American-British Laboratory Report No. ABL 1045-MK2; 13 August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2043. ANONYMOUS, "German Radio Direction Finding Receiver Peilgerat E. P. 2a," Signal Corps Enemy Equipment Intelligence Service Report No. SC:EEIS-10-1; 23 August 1944. See also Department of Commerce PB19732 and PB2277. ABSTRACT NO 1: The E. P. 2a, serial number 97792, manufactured by Telefunken in 1937 was taken from a German Engineer Mine School in Angiers. The set is in good condition, but lacks antenna and power supply. This set appears to be very similar to the L. Mw. P/24b-315 and the Italian Model RDG. E. 393N (cf. SIGNAL COMMUNICATION EQUIPMENT USED BY ENEMY NATIONS, Ministry of Supply, S. R. D. E., Somerford, Christchurch, Hants., Sheet B10/1). A translation of the technical characteristics of the set, from the German instruction manual, is appended to the report. The receiver is housed in one container, which has provisions for carrying straps and a pad to protect the back of the carrier. The set measures 18-1/2" in height, 13-1/2" in width, and 8-1/4" in depth. The set weighs approximately 50 lbs. The case is made of wood covered with light sheet-steel, and is of sturdy construction. The operating controls found on the front of the chassis are: The tuning control (Abstimmung), a band switch (not labeled), a regeneration control (Ruckkopplung), a filament rheostat (H), an On-Off power switch (Aus-Ein), a battery and tube test switch (Batterie-Rohren), a D/F balancing switch (Peilen-Seite), an antenna selector switch (Search - D/F) (Rund-Empfang-Peilen), a D/F balancing rheostat (Regler fur Seite), and a D/F balancing condenser (Regler fur Peilen). The frequency range is 70-3600 Kc/s in five bands. The frequency is calibrated on the dial face which reads directly in kilocycles. The set is capable of receiving type A1, (continuous wave emission), and A2 (Tone modulated continuous wave emission), and A3 (Radiotelephone emission) signals. It is difficult to make a valid estimate of reception range; however, it may be said that the set is extremely insensitive, 15-30 uv/m CW reception is somewhat better than R/T reception. ABSTRACT NO. 2: Description, photographs, wiring diagram and performance data are given for this receiver. In general, the set is satisfactory for D/F on strong signals, but is not good D/F receiver due to its poor sensitivity and type of regeneration used. (a_1-1, a_2-3, b-3, c-1, d-1, e-845, f-See Abstract No. 2029)

2044. KEMP, C. G., "VHF D/F System Employing Visual Presentation Methods Employed by Messrs. Standard Telephone and Cables, Ltd." Royal Aircraft Establishment, Ministry of Aircraft Production (British), Technical Note RAD61; 25 August 1944. ABSTRACT: Not available. (a-1, b-3, c-1, d-5, e-0, f-0)

2045. ANONYMOUS, "Radio Set SCR-551-A and Radio Set SCR-551-B," US War Department Technical Manual, No. 11-247. See also Department of Commerce PB39550, pp. 132; 26 August 1944. ABSTRACT: This equipment is a semiportable, ground, radio direction finder station. It has a frequency range of 2 to 20 megacycles, covered in four bands, and provides for the reception of AM or CW signals. A rotatable Adcock antenna is used and signal nulls are indicated both visually and aurally. The visual indicator is an oscilloscope, and speaker or headphones are used for aural operation. Three radio transmitters BC-978-A are supplied with this radio equipment. They are compact, self-powered (dry batteries), short range trans. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2046. TULLY, R., "Final Synoptic Report on Operation of Radio Direction Finding and Intercept Equipment in A TOUSA," Office of the Commanding Signal Officer, Headquarters, Communications, ETO, Report: TL/3D/NC-pc (Coles: D/F Group); 30 August 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2047. SMITH-ROSE, R. L., ROSS, W., AND BURGESS, R. E., "The Improvement of the Polarization Error of U-Type Adcock Direction Finders with Earth Mats," National Physical Laboratory (British) Report No. RRB/C. 104; 31 August 1944. ABSTRACT: An investigation was carried out to ascertain the practicability of using an earth screen of mat of reasonable dimensions to remove or reduce the errors experienced with the U-type of Adcock direction finder due to the introduction of signal voltages into the system by the horizontally polarised component of the waves when the aerial feeders are laid on or buried in ground of imperfect conductivity. The polarisation error of a standard form of direction finder erected in the normal manner at a site on highly conducting ground was measured over the frequency range of 3-10 Mc/s. An earth mat about 100 ft in dia and of a square mesh between 1 and 3 ft was then installed at the D/F, and the measurements were repeated for various experimental arrangements of this installation. It was found that, with the mat raised above and insulated from ground, the polarisation error of the direction finder was seriously increased; but when was effectively connected to earth, both around its perimeter and at an intermediate radius, there was a slight overall improvement in the error. (a-1, b-3, c-1, d-5, e-254, f-Experiment)

2048. ANONYMOUS, "Handbook of Maintenance Instructions for Radio Receiving Equipment AN/ARN-5 and AN/ARN-5A," U. S. War and Navy Departments, Air Council of the United Kingdoms; Report: AN-08-30 ARN5-3; September 1944. See also Department of Commerce Report PB14845. ABSTRACT: A Radio Receiving Equipment AN/ARN-5 or AN/ARN-5A is airborne equipment designed to give vertical guidance to a pilot during aircraft landing operations. This equipment is part of an instrument approach system which provides both lateral and vertical guidance, lateral guidance being applied by Radio Receiving Equipment RC-103-A. The major assembly of Radio Receiving Equipment AN/ARN-5 is Radio Receiver R-57/ARN-5. The major assembly of Radio Receiving Equipment AN/ARN-5A is Radio Receiver R-89/ARN-5A. Either ultra-high frequency "glide-path" receiver is used to pick up signals from an associated glide-path transmitter located adjacent to the landing strip or runway. One or two cross-pointer indicators provide visual indication to the pilot of the position of the aircraft with relation to the glide path. (Special Notice: A limited number of single-channel Radio Receivers R-47/ARN-5 are in the field for training purposes. Their operation is similar to that of Radio R-57/ARN-5 when the latter is operating on any one channel.) (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2049. ANONYMOUS, "The 'Cosmos' Receiver," Admiralty Signal Establishment (British) Report M 659; September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, f-0)

2050. FRAUMANN, J. W., AND GUARINO, P. A., "Development of an Adaptor to Give Simultaneous Radar and D/F Signals on the PPI of a Radar System," NRL Report R-2356. See also Department of Commerce PB 109293; September 1944. ABSTRACT: This report describes a system for transcribing an indication of bearing from the model CXGH direction finding equipment onto a radar plan position indicator. The "figure 8" pattern of the direction finding equipment is superimposed on the regular PPI pattern. The operator can then identify targets when the radar bearing and CXGH bearing coincide. No internal changes are required in the PPI to present this information, and only slight modifications of the CXGH are required. This system is also readily adaptable to other types of direction finding equipment. NRL R-2356. NAVSHIPS Prop S584 R-C. (a-3, b-3, c-1, d-1, e-0, f-Description)

2051. GRIFFITH, R. M., AND EDWARDS, A. T., "First Sea Trials of D/F Outfit FV5 in the Frequency Range 100 - 125 Mc/s," Admiralty

Signal Establishment (British) Report N. 654; September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Field test)

2052. JASIK, H., "VHF 'V' Antenna for Aircraft," Communications, vol. 24, pp. 33-35, 83-86; September 1944. ABSTRACT: An antenna for the frequency range near 100-150 mc is described and calculations are made of the field pattern and radiation impedance. A fairly complete mathematical analysis is made and supporting experimental data is given. (a-6, b-2, c-1, d-1, e-0, f-Descriptive analysis)

2053. SHERMAN, J. B., "Circular Loops at Ultra-High Frequencies," Proc. IRE, vol. 32, no. 9, pp. 534-537, September 1944. ABSTRACT No. 1: The theoretical radiation patterns are obtained for circular loops having circumference equal to an integral number of wavelengths. ABSTRACT No. 2. Radiation characteristics of single-turn circular loop aerials are investigated theoretically and practically at wavelengths approximating to the loop dimensions. By the use of spherical co-ordinates the field integral is resolved. The result for a closed loop is of the type:

$$E = (60\pi^2 IR_j^a/\lambda d)\cos HA\,[J_a(H) - J_b(H)]$$

where I is peak current in loop, R is radius, d is distance to point of field intensity E, and a, b, H and A are constants for the loop depending on R and λ. For an open loop, the result is the same, but sin HA replaces cos HA so that the max and min of the radiation pattern are interchanged. Patterns in the plane of the loop for closed loops of circumference, λ, 2λ and 3λ, are given. Radiation along the axis of the loop is zero for all loops whose circumference contains an odd number of λ other than unity, due to cancellation of current in opposite segments. Experimental results obtained with a 150 cm oscillator bear out the theoretical predictions. ABSTRACT NO. 3: The radiation characteristics of single-turn circular loops are investigated at wavelengths of the order of loop dimensions. Expressions are obtained for the distant field intensity in the plane of the loop and on the axis. Radiation patterns are shown for loops of various dimensions. (a_1-6, a_2-3, a_3-1, b-1, c-1, d-1, e-0, f-Analysis)

2054. BROWN, L. W., "The Experimental Radio-Theodolite," British Thomson-Houston Co., Ltd. (British) Report: L-280-S; 4 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2055. McGRUDER, J. H., "HF D/F Direction Finder Net -- Results of Tests in Determining Aircraft Positions," USN ComEasSenFron: ESF20/A6-2(DF) Ser. 08276; 5 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2056. WELLS, H. W., SEATON, S. L., AND BRAMHILL, E. H., "Correlation of Direction Finder Errors with Ionospheric Conditions, College, Alaska, August 16, 1943 to June 30, 1944," Carnegie Institute, 8 September 1944. See NRL Report RS 24667. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2057. ANONYMOUS, "Short Range Navigational System," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 279; 9 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2058. ANONYMOUS, "Instruction Book for Model DAU H. F. Radio Direction Finder Equipment," Federal Telephone and Radio Corporation, Newark, N. J. See Department of Commerce PB24923; 12 September 1944. ABSTRACT: The model DAU equipment is a shipboard radio direction finder which provides instantaneous visual indications of the bearings of received signals in the frequency range of 1.5 to 22 megacycles through the use of a scanner, a cathode-ray tube and a motor driven goniometer. The scanner permits the operator to see a bandwidth of 75 kilocycles on either side of the frequency to which the receiver is tuned. Description of the equipment and fundamentals of direction finding are followed by instructions for the installation, calibration, operation, adjustment and maintenance of the equipment. Parts lists, color code, and supplementary data on CFT-52300 target transmitter with outline drawings are included. There are also photographs, drawings, diagrams and graphs. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2059. ANONYMOUS, "Direction Finder Stations - Aeronautical Service," USN OpNav:Op-20-Z-F 2 lvr Ser. 0609420 (SC)A6-2(5) (USN BuShips 925D:N-11. 8-138); 18 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2060. ANONYMOUS, "Japanese Aircraft Radio - Type of Aero Mark 4 Radio Direction Finder," Federal Economic Administration Report No. 13; 23 September 1944. See also NRL Report RS0010737. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

2061. ELAM, E. M., "Characteristics of Japanese Type 93 Direction Finder Short Distance Model 1 Found on Iwo Jima," Signal Corps, Preliminary Report on Captured Radio Communication Equipment, NRL Report RS034094; 23 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

2062. ANONYMOUS, "Radio Set SCR-555-A," US War Department, Technical Memo No. 11-251. See also Department of Commerce PB22214; 25 September 1944. ABSTRACT: This equipment is a self-contained, semiportable, ground, radio direction finder station. The equipment has a frequency range of 18 to 65 mc, covered in two bands, and provides for the reception of amplitude-modulated or continuous-wave signals. The RDF can be used to determine the direction of radio transmitters located on the ground or in aircraft. A rotatable Adcock antenna is used and signal nulls are indicated both visually and aurally. The manual has sections on description, installation and operation, functioning of parts, maintenance, and supplementary data. There are photographs, sketches, schematic and wiring diagrams. (a-3, b-3, c-1, d-1, e-0, f-Description)

2063. ALFORD, ET AL., "Tests of M4100 System Installed on USS Gunason," Radio Research Laboratory; Technical Report No. 411-105; 25 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2064. ANONYMOUS, "Blueprints of Wiring Diagrams of Japanese Radio Homing Gear and Direction Finders," USN, OP-16-FF; Translation No. 62; 28 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-6, e-0, f-Translation)

2065. ANONYMOUS, "German Radio Direction Finding Receiver, TP (LM) 6/315," Signal Corps, Enemy Equipment Intelligence Service Report No. 10-5. See also Department of Commerce PB2278; 29 September 1944. ABSTRACT: A brief description and photographs of this receiver are given. No performance tests were made. This set is very similar to set EP2A described in PB2277. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2066. ANONYMOUS, "Radio Set SCR-556-A," US War Department, Technical Manual No. 11-255. See also Department of Commerce 39422, p. 49; 29 September 1944. ABSTRACT: Radio set SCR-556-A is a self-contained, semi-portable, ground, radio direction finder (RDF) station. The equipment has a frequency range of 65 to 156 mc and provides for the reception of amplitude-modulated or continuous wave signals. The RDF can be used to determine the direction of radio transmitters located on the ground or in aircraft. A rotatable Adcock antenna is used and signal nulls are indicated both visually and aurally. The visual indicator (bearing meter) is a microammeter, while headsets are used for aural operation. The radio operator rotates the Adcock, radio equipment, and the telephone operator by moving his own body. After the RDF has been oriented to some reference line, using the compass and telescopic sight, the direction of the incoming signal with respect to the reference line is indicated in degrees on the azimuth scale. The set can be packed in 13 chests and crates. Installation and operation and maintenance instructions are given together with description of the main and auxiliary components and of the functioning of parts. Photographs, drawings, graphs, schematic, circuit and other diagrams, and parts list are included. This manual supersedes TM 11-255 (tentative) Feb 10, 1944. (a-3, b-3, c-1, d-1, e-0, f-Instruction)

2067. ANONYMOUS, "Automatic VHF Direction Finder. Appendix I," Standard Telephone & Cables, Limited; Technical Report No. 32; 30 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2068. ANONYMOUS, "Radio - Direction Finding - Calibration of Model DAB Direction Finder Equipment at Naval Air Station, Bermuda, Report of," NRL Letter Report No. C-S67/69(342:agl) C-342-45; 30 September 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2069. ANONYMOUS, "Broad Band Radar Monitor Station," (German)

(ESL 46-1453- & 6-55-44-10-43-UT-1). October 1944. See University of Illinois, Department of Electrical Engineering, Technical Report No. 3, p. 168a, 1 February 1948. See also Abstract No. 2912. ABSTRACT: Not available. (a-4, b-3, c-0, d-0, e-0, f-0)

2070. ANONYMOUS, "Direction-Finding Equipment (A 100 a 1)," (German:Telefunken) See: Air Document Index No. R2705 F592, October 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2071. ANONYMOUS, "Instruction Book for Direction Finder Model CXFF," Federal Telecommunications Laboratories, Nutley, New Jersey, October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2072. ANONYMOUS, "Japanese High Voltage Direction Finder, Type 98," Signal Corps, Enemy Equipment Intelligence Service Report No. 39. See also Department of Commerce PB52274, p. 19; October 1944. ABSTRACT: The Japanese direction finder discussed in this report is designed to locate commercial power plants producing AC electric power ranging in frequency from 20 cycles to 100 cycles per second. The equipment consists of three basic components, a directional loop, a battery case, and a low frequency high gain amplifier, plus associated cabling, headset and output meter. Translations from captured instruction manual are given on the description and operation of the set. It is reported that the range under ideal conditions is not believed to exceed a few miles maximum although the set is an extremely well built piece of equipment mechanically. An accuracy of within one degree is claimed for the units in the factory test record. Photographs of the amplifier, antenna, and meter and a schematic diagram of the amplifier are included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2073. ANONYMOUS, "Pre-Preliminary Instruction Book 140 Mc. - 600 Mc. Direction Finder," Federal Telecommunications Laboratories, Nutley, N.J.; October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e 0, f-Instructions)

2074. ANONYMOUS, "Setting up of a Direction Finding Station with the Monitoring Equipment Korfu," (German:Blaupunkt-Werke) See: Air Document Index No. R2616 F763; October 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

2075. COOPER, V. J., AND GREEN, E., "The Design of Directional Aerial Arrays," Marconi Rev., No. 75, pp. 2-16; October-December 1944. See also No. 76, pp. 12-23; January-March 1945. ABSTRACT: A method is demonstrated of designing an array to give a mathematically exact polar curve of field strength to any preconceived law. It is assumed that the equation of the polar curve is known or can be determined. From a Fourier analysis of the known form of the curve, the physical configuration of the array can be completely determined. Where the size and extent of an array has an economical limit, as is usual in practice, approximations can be made and methods to obtain these are illustrated by the design of typical arrays with special reference to equisignal beams for navigational purposes. (a-3, b-1, c-1, d-5, e-0, f Theory)

2076. FOSTER, D., "Loop Antennas with Uniform Current," Proc. IRE, vol. 32, pp. 603-607; October 1944. ABSTRACT NO. 1: A mathematical analysis of loops which may be large in wavelengths but which are assumed to have uniform current distribution. (Methods of feeding such loops in segments had previously been described.) Valves of radiation resistance and directivity curves are shown for various loop sizes. ABSTRACT NO. 2: The properties of a circular loop carrying uniform current are calculated for loops of any size relative to the wavelength. The radiation resistance and the greatest directivity pass through a series of max and min as the frequency is increased. At frequencies below that of which one wavelength is contained in the circumference, the directivity graph is nearly independent of frequency. As the frequency is increased, additional lobes appear, the principal lobe tending to point more nearly in the direction normal to the loop. ABSTRACT NO. 3: The properties of a circular loop carrying uniform current are calculated for loops of any size relative to the wavelength. The radiation resistance and the greatest directivity pass through a series of maxima and minima as the frequency is increased. At frequencies below that for which one wavelength is contained in the circumference, the directivity graph is nearly independent of frequency. As the frequency is increased, additional lobes appear, the principal lobe tending to point more nearly in the direction normal to the loop. The paper includes a note on other loops, and a mathematical appendix dealing with certain integrals involving Bessel functions. (a_1-6, a_2-3, a_3-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

2077. SCHERER, "Operational Tests of Direction Finder Peil G6," (German D. L. H.) See: Department of Commerce PB51378, pp. 28; October 1944. ABSTRACT: Advantages and disadvantages of direction finder Peil G 6 are discussed, particularly in comparison with the first direction finding and homing device used by the German Air Force. The manual operation of the receiver and the direct frequency calibration, the clearer tone, the steadier indication and the more dependable direction finding, in spite of interferences, make this instrument substantially better. Installation is also simpler. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Test report)

2078. TRAGER AND REITINGER, "Electro-Acoustical Direction Finding," (German) See:Air Document Index No. R2215 F559; October 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2079. BRAY, W. J., LILLICRAP, H. G., AND EWEN, A. B., "Long and Medium Wave Capacitive Radio-goniometer (Types W31/5 and W31/5) for Army Use," General Post Office (British) Report No. 1214; 2 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-33, f-Description)

2080. BRAY, W. J., AND LILLICRAP, H. G., "A Long and Medium Wave Artificial Adcock Aerial Unit," General Post Office (British) Report No. 1215; 2 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2081. WHITBY, O. W., "Comparison of Top and Bottom Mounted AN/APA-24 Antenna on Ferret 12," Radio Research Laboratory Test Report No. 411-TR-40. See also Department of Commerce PB13972; 2 October 1944. ABSTRACT: Poor results have been reported with the AN/APA-24 direction finding antenna mounted on the top of a B-24-J just above the waist windows. This report describes tests conducted specifically with the object of discovering a location for the antenna which would yield satisfactory results of Ferrets 12 and 13. Due to the strict limitations placed on the time available for the tests by the fact that the planes were urgently needed in the theatre, it was decided to seek merely any satisfactory solution to the problem. This barred the making of sufficient tests to fully compare the performance of the antenna at all possible mounting locations on the plane. After getting D/F error data for the top mount position with and without the plane's communication antennas in place, a rotatable horizontal dipole that protruded below the underside of the aircraft was installed with its vertical supporting shaft sticking up into the RCM compartment. This location for the antenna gave such vastly superior results to those obtained with the antenna mounted on top that it was decided to consider this a solution to the problem as far as Ferrets 12 and 13 are concerned. Photographs, tables and graphs are included. (a-3, b-3, c-1, d-1, e-0, f-Test report)

2082. GLEASON, R. F., "Preliminary Model of X-DAX and X-DAY," NRL Report; 4 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2083. HENDERSON, R. S., "Report on D.F. Remote Control Unit Type C167-Bsl-38," Signal Corps, Enemy Equipment Intelligence Service Report: EEIS-11: 4 October 1944. See also NRL Report RS 27503. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2084. HARBURY, P. L., "M4502 Antenna for the M2300 and M2600 Direction-Finding System," Radio Research Laboratory, Transition Memorandum Report No. 411-TMR-110D; 9 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2085. ANONYMOUS, "Installation Specifications for AN/APA-24 Direction Finder Equipment," U.S. Navy, Bureau of Aeronautics. See Department of Commerce PB13605; 10 October 1944. ABSTRACT: The purpose of this specification is to give in detail BuAer requirements and other information necessary for completing a satisfactory installation of the AN/APA-24 direction-finder equipment in naval aircraft. This specification is applicable to naval aircraft only if included as a part of the airplane specification or referenced in writing by

BuAer. Deviations from this specification shall not be made except by written authorization by BuAer. The specifications present certain requirements which involve the location of various components. However, the ultimate location of all components of this equipment is subject to flight tests and BuAer approval prior to incorporation in production aircraft. Suggestions from service units and contractors concerning proposed modification of the installation or improvement of this specification will be appreciated and will receive careful consideration. (a-1, b-3, c-1, d-1, e-845, f-Specifications)

2086. ANONYMOUS, "Japanese Aircraft Radio," Federal Economic Administration Report; 10 October 1944. See also NRL Report RS 0010596. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2087. ANONYMOUS, "Shipborne Tests of M2600 (CXGA) Radar and Radio Direction Finder," Radio Research Laboratory: Technical Report No. 411-109; 11 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2088. PRESSEY, B. G., "The Principles Underlying the Design of a Radiogoniometer of the Compound Wound Search Coil Type for Very High Frequencies," National Physical Laboratory (British) Report: RRB/c. 106; 11 October 1944. ABSTRACT: The paper describes a theoretical and practical investigation into the principles underlying the design of a radiogoniometer of the compound wound search coil type. In this type of instrument the search coil is wound in two sections the planes of which are set at an angle to each other and reduction of coupling error is achieved by adjustment of this angular separation. It is shown that the optimum value of the angular separation is dependent entirely upon the configuration of the magnetic field and that if this is known the angle can be deduced. The dependence of the field configuration upon the arrangement of the field coils is investigated and design data obtained for a particular type of construction. The principles are applied to the design of a VHF goniometer suitable for operation over the frequency band 30-100 Mc/s. The measured performance of this instrument was in very close agreement with that predicted theoretically. The optimum angle of separation was 60° and the maximum error 0.8°. The coupling factor was 0.33. The electrical symmetry of the field coils with respect to the screening case with the search coil in an asymmetrical condition was measured and found to be of a high order and incapable of giving any appreciable error even under the most stringent conditions. It is concluded that this type of goniometer is very suitable for VHF operation. (a-1, b-3, c-1, d-5, e-210, f-Theoretical analysis)

2089. ANONYMOUS, "Collector System for Aircraft Direction Finder 20 to 100 Mc/s," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 280; 12 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2090. ANONYMOUS, "Radio-Direction Finding-Model SCR269 Determination of Maximum Spacing for Loops of Two Equipments on Air-Craft Problem A21.01T - Final Report on," NRL Letter No. C-S67/69(301B) C340-467; 12 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

2091. ANONYMOUS, "M3000 Direction Finding Equipment for Airborne Use - Preliminary Instruction Book," Radio Research Laboratory: Instruction Book No. 411-IB28A; 15 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, d-0, f-Instructions)

2092. ANONYMOUS, "Supplementary Installation and Operating Instructions for Radio Set SCR-291-A," War Department Technical Memo No. TM-11-243-2; 15 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2093. CAMP, P. R., "Test of CXGA Shipborne Radar Direction Finding Equipment," NRL Report No. R-2386; 15 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2094. ANONYMOUS, "Phase Comparison Shipboard Direction Finders for Ultra High Frequencies and Very High Frequencies," Federal Telecommunications Laboratories, Nutley, N. J., Proposal No. 261; 17 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2095. ANONYMOUS, "M-4100 Direction Finding Systems," Radio Research Laboratory, Technical Memorandum Report No. 411-TMR-117; 20 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2096. COOLEY, R. D., AND GAGER, F. M., "C2100 'Setter' Direction-Finding System Test and Service Designation AN/APA-24," Radio Research Laboratory, Test Report No. 411-TR-44. See also Department of Commerce PB13979; 20 October 1944. ABSTRACT: The C-2100 "Setter" is a null-type direction-finding system, designed for oscillographic or headphone indicating means, and usable with any receiver having the desired sensitivity and tuning range. This report describes the results of tests and measurements on the measurements on the major components of the system. Photographs and diagrams. (a-3, b-3, c-1, d-1, e-0, f-Test report)

2097. MARTIN, S. T., "Employment of Radio Intelligence in Tactical Support of Army Air Corps as Observed in Italy 11 May 1944 to 15 August 1944," Office, Commanding Signal Officer, SPBGD 413, 684 (RDF); (Coles: D/F Group); 24 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2098. ANONYMOUS, "Radio - Direction Finding - Model DAK-2 and DAR-3 - Balance System for, Development of - Interim Report - Bu-Ships Problem S801R-C," NRL Letter Report No. C-S67/69 (301 B) C-340-479, October 28, 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2099. ANONYMOUS, "An Experimental Automatic VHF Direction Finder. Pt. I: General Description of the Equipment," Standard Telephone and Cables, Ltd. (British), Technical Report No. 42; 30 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description of equipment)

2100. EDWARDS, W. H., "Supplemental Information on German Direction Finding Receiver in Technical Operation and as a Part of a Fixed D/F Installation," Signal Corps, Enemy Equipment Intelligence Service Report: EEIS-10; 31 October 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2101. ANONYMOUS, "German Radio Frequency Direction Finder FuPeil-E3 (Short Title: AF IS 50)," (German) NRL Report No. RS023481; November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

2102. ANONYMOUS, "German RF Direction Finder FU Peil-E3," Signal Corps, Enemy Equipment Intelligence Service Report No. 50. See also Department of Commerce PB20333; November 1944. ABSTRACT: This is an eleven-tube two-band receiver employing two stages of tuned RF amplification, a mixer and a local oscillator stage; three stages of RF amplification, a second detector stage, a BFO stage, a visual indicator stage employing a vacuum tube and gaseous indicating lamp, and an audio amplifier stage. This receiver, together with a power supply, are contained in a single metal case. Replacement of tubes is simplified by the use of only one tube type. It is used for radio direction finding and communication with aircraft and may be operated from commercial alternating current or from A and B batteries. Photographs, parts lists and circuit diagrams are appended. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2103. ANONYMOUS, "Installation and Operating Instructions for Mobile Direction Finder Fu Peil A 40 h," (German: Telefunken) See: Air Document Index No. R2276 F135; November 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-Instructions)

2104. ANONYMOUS, "Radar D/F Set Fu MO 62 and 62," (German); November 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2105. ANONYMOUS, "Test and Calibration of Radio Direction Finders for Site and Instrumental Error," War Department TB Sig. 113; November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

2106. ANONYMOUS, "Wright Field's Ham-Built Direction Finder," QST, vol. 28, pp. 42-43; November 1944. ABSTRACT: Description of a VHF beam antenna using a three-element Yagi system for obtaining rough bearings. (a-6, b-2, c-3, d-1, e-0, f-Description)

2107. AIKENS, A. J., AND CHAPMAN, A. G., "Direction Finding by Improvised Means," Bell Telephone Laboratories, Inc., New York, Final Report: Project No. 13-101. See also Department of Commerce PB-108827, November 1944. ABSTRACT: This report consists of 30 pages concerning contract No. OEMsr-1410 and deals with (1) radio direction finding, and (2) NDRC Division 13. (a-4, b-3, c-1, d-1, e-0, f-Discussion)

2108. DEWITT, J. H., AND RING, A. D., "Significant Radiation from Directional Antennas of Broadcast Stations for Determining Sky-Wave Interference at Short Distances," Proc. IRE, vol. 32, No. 11, pp. 668-673, November 1944. ABSTRACT: The present practice in the design of directional antennas for broadcast stations to prevent sky-wave interference to another station on the channel at short distances does not necessarily accomplish the purpose. The interference signal has been computed from the radiation along one path at a fixed vertical angle. This practice has been generally followed by consulting engineers and has been acceptable to the Federal Communications Commission. Measurements indicating the length of the path of sky-wave signals received at short distances show that the signals take various paths and are not confined to a single path. Measurements were made by pulse transmissions of the relative time required for sky-wave signals to arrive at a receiving point some 230 miles from the transmitter. Control was had of the vertical radiation pattern. The records made of the received signal indicate varying heights and conditions of the reflection layer. To assure that no interference is caused by sky-wave signals, in accordance with the Commission's Standards of Good Engineering Practice, the Standards must be modified to require proper consideration of the radiation at all angles which constitute the "appropriate vertical vector." (a-1, b-1, c-1, d-1, e-0, f-Analytical study)

2109. GIANNINI, G. M., "Lightweight Magnetic Direction Indicators," Aeronautical Eng., Rev., vol. 3, no. 11, pp. 31-32 and 43; November 1944. ABSTRACT: Autoflight direction indicators weigh only 1.1 and 0.5 lb, respectively, are comparatively inexpensive, and, unlike conventional card compasses, are read by means of rotating pointer operating like watch hand. (a-3, b-2, c-1, d-1, e-0, f-Description)

2110. POLYDOROFF, W. J., "Iron-Cored Loop Antenna," Electronic Ind., vol. 2, p. 84; November 1944. ABSTRACT NO. 1: The author points out that, for a given effective height, an iron-cored loop need be only about one third the size of an air-cored loop. ABSTRACT NO. 2: Radio direction finders come into a greater prominence with the development of long distance aircraft and extended operations, particularly over long stretches of water. For years it has been known that the longer the wave length is, the more reliable become radio bearings taken by a craft from a fixed shore station. For this reason particularly, commercial aviation has reserved for its use in America a frequency range from 200 to 400 kc at which frequencies bearings can be taken with certainty. It appears that still lower frequencies will provide better aid for navigation purposes. The frequencies as high as highest broadcast frequencies have been used to take bearings on a conveniently located broadcast station, but at the frequencies higher than one megacycle the bearings cannot be relied upon, especially when ionization of the upper atmosphere causes reflected sky waves which may produce erratic deviations of the bearing. A similar effect has been noted in television technic, causing a distortion of the images and consequently television reception is usually restricted to the optical path. This effect of distortion of the direction of wave front is often called "night effect" or "sky effect" and has been particularly studied in long distance radio navigation. Thus it appears that with the advancement of high frequencies the direction finding of the future will be still limited by the mentioned phenomenon to the frequencies below one megacycle, when simple and compact radiation collectors are considered. While wave propagation across salt water is fairly regular, numerous references from the past indicate that the path chosen by the wave is not always a great circle route. For all practical purposes navigation can be successfully maintained by the use of the direction finding radio equipment, especially designed for this purpose. A most essential part of this equipment is the loop antenna which for many years has been successfully used on board ships and relatively recently universally adapted for aircraft. The loop, as has been known ever since its introduction, possesses desirable directional characteristics, substantially approaching a figure "8" and numerous workers have dealt with these characteristics showing in detail influences of various factors affecting loop polar characteristics. The most important is the position of a loop with its axis parallel to the direction of propagation, at which position very little signal voltage is induced in the loop antenna. This position is utilized for direction finding. Two such positions are at 180 deg to each other and therefore an ambiguity of the same order is present. Because zero position serves for the determination of direction, the minimum of the signal may be confused with the absence of the signal and several systems are known to overcome these difficulties by additional signal pickups, which when combined with the figure "8" pattern produce either true or "apparent" cardioid pattern. (a_1-6, a_2-1, b-2, c-1, d-1, e-0, f-Description)

2111. POSTLETHWAITE, F., "A Cathode-Ray Universal Flight Attitude Instrument," Electronic Engineering, vol. 17, pp. 229-235; November 1944. ABSTRACT: The several instruments conveying the flight attitude of aircraft can be replaced by one universal c. r. instrument. The indicator is the shape of an aircraft traced on the c. r. o. screen by an arrangement of motor-driven cams, electric lamps and photoelectric cells. By altering the shape and position of the aircraft image on the screen and by the use of two auxiliary spot indicators the following variables are indicated: aircraft speed, height, rate of climb or descent, bank and turn, flaps up and down, undercarriage up and down, icing of wings, level of fuel and compass bearing. These variables are detected by electrical pick-up devices situated at the appropriate points in the aircraft and the resulting electrical signals transmitted by multicore cables to the actual c. r. instrument mounted on the pilot's panel. A horizon bar operated from a Sperry-type artificial horizon works in front of the c. r. o. screen and shows position relative to the horizon. The switching of the c. r. o. beam to indicate the different variables is done by a motor-driven rotary switch. Normally visible is the aircraft trace differing in size, position, and shape according to the aircraft's condition and position and two spot indicators giving height and compass bearing on scales marked on the tube, the speed of operation being fast enough to prevent visual flicker. Typical screen pictures are given with interpretations. (a-3, b-2, c-1, d-1, e-0, f-Description)

2112. SHARPLESS, W. M., "Measurements of the Angle of Arrival of Microwaves in the X-Band," Bell Telephone Laboratory, N. Y. C. Report; November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2113. TWIST, B., "Army Radio D/F Networks," Electronics, vol. 17, No. 11, pp. 118-124; November 1944. ABSTRACT: Description of SCR-291 radio direction finder used by AACS to provide accurate bearings for military pilots on world wide air routes; indications appear on cathode ray screen. (a-3, b-2, c-1, d-1, e-0, f-Description)

2114. ALLISON, J. L., "Survey of Airborne Direction Finders," NDRC Div. 13; 1 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2115. McCOY, R. E., WILLIAMS, R., AND SMITH, S. L., "Automatic Direction Finder and Automatic Plotting Device," Signal Corps Engineering Laboratory, Eatontown, Engineering Memo No. 63; 1 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2116. ANONYMOUS, "Radio - Direction Finding - Problem S331. IR-C - Redesign of Sense Circuit - DAV-2 - Interim Report," NRL, Letter Report No. C-S67/69(3426)C342-66; 4 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2117. CLARK, T. H., "Tests and Improvements of Operation of Low Frequency Collectors for Model DBB Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 95; 4 November 1944. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-87, f-Test and modification)

2118. ANONYMOUS, "CXGH Direction Finder with Indicator Attachment for PPI," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 97; 4 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2119. ANONYMOUS, "Direction Finding Equipment British Type FV5," Admiralty Signal Establishment (British) Handbook No. RH.510; 7 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Handbook)

2120. ANONYMOUS, "German Technical Library," Air Ministry (British) Report A. I. 2(g)1679; 10 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2121. ANONYMOUS, "Radio - Direction Finding - High Frequency

Production Model DAU, Serial No. 1, F. T. & R. Corp., Problem S9205-C Report of Tests Conducted at F. T. & R. Factory and at NRL," NRL Letter Report No. C-S67/69(342:RG)C342-74, 10 November 1944 ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2122. ANONYMOUS, "Radio - Operation of Model DBF Very High Frequency Direction Finding Equipment on Aircraft Carriers," U.S. Naval Vessel: USS Bremington (CV20); 10 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2123. CAMP, P. R., AND GUARINO, P. A., "Type Test of AN/APA-17A Airborne Radar Direction Finding Equipment," NRL Report No. R-2383. See also Department of Commerce PB28703; 10 November 1944. ABSTRACT: This report describes tests on the type AN/APA-17A direction finding equipment. The AN/APA-17A is aircraft equipment designed to work in conjunction with an APR-1 receiver and cover the frequency band from 250 to 1000 mc for both horizontally and vertically polarized signals. It utilizes a rotating antenna to give 260° coverage and a cathode ray tube for visual presentation. The equipment was tested to determine its bearing accuracy, its sensitivity, the frequency response of its video circuits, the amplitude linearity of the scope deflection, and the following accuracy of its synchro system. It was also examined for mechanical defects and tested for susceptibility to heat, humidity, cold, altitude and vibration. Test data are presented in tabular and graphic form. (a-3, b-3, c-1, d-1, e-0, f-Test report)

2124. ANONYMOUS "Radio - Radar Intercept System for Submarine Model XCV, NRL Problem S180. 1R-S Final Report on," USN NRL: Ltr. C-S67/69(342C)4080; 11 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2125. FLETCHER, H., WHORLOW, R. W., AND HARWOOD, J., "Tests of Army D.F. Station Transportable Adcock No. 1 - Final Report," Scientific Advisory Council, Ministry of Supply (British), Report No. AC7580; 11 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2126. ANONYMOUS, "High Voltage Direction Finder Used to Locate Power Plants," (Japanese) Joint Electronics Intelligence Agency; Report No. 6737; 14 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-0)

2127. CAMP, P. R., "Type Test of AN/APA-17 Airborne Radar Direction Finding Equipment, "NRL Report No. 2388. See also Department of Commerce PB28707; 15 November 1944. ABSTRACT: This report describes the type tests conducted by this laboratory on the type AN/APA-17 direction finding equipment manufactured by Aviola Radio Corporation. The AN/APA-17 is aircraft equipment designed to work in conjunction with an APR-1 receiver and to cover the frequency band from 250 Mc to 1000 Mc for both horizontally and vertically polarized signals. It utilizes a rotating antenna to give 360 coverage and a cathode ray tube for visual presentation. The equipment was tested to determine its bearing accuracy, its sensitivity, the frequency response of its video circuits, and the amplitude linearity of the scope deflection. It was also examined for mechanical defects and tested for susceptibility to heat, humidity, cold, altitude, and vibration. The results of the tests and recommendations are given. Graphs. (a-3, b-3, c-1, d-1, e-0, f-Test report)

2128. ANONYMOUS, "Use of HF/DF Net in Determining Aircraft Positions - Results of Tests on," USN ComCaribSea; Fron:CCSF/A6-2, Ser. 0823; 17 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test results)

2129. ANONYMOUS, "Radio - Direction Finding - Installation of a Model DBF in a DAW Mobile Trailer - BuShips Problem S408. 1T-C - Interim Report on," NRL: Letter Report No. C-S67/69 (342f)C342-103; November 18, 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2130. ANONYMOUS, "Radio - Direction Finding - Problem S331. 1R-C Test of Production Model of DAV-2 with Redesigned Sense Circuit - Final Report," NRL: Letter Report No. C-S67/69 (342:RG)C342-129; 22 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2131. ANONYMOUS, The Radio War," Admiralty (British) Report No. C.B. 04050/44(9); 22 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2132. ANONYMOUS, "Countermeasures and Deception - Summary of Information Issue No. x - November 25, 1944," Joint Intelligence, Central Pacific Ocean Area: Report No. A22 0012 004017; 25 November 1944. See also NRL Report No. RS 0012067. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2133. ANONYMOUS, "The Structure of Electromagnetic Fields During Conditions of Anomalous Propagation," Radar Research Development Establishment, Ministry of Supply (British), Report No. 258; 25 November 1944. See also NRL Report No. RS 023743. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

2134. MARGOLIN, J., "M4101 Medium Spinner," Radio Research Laboratory: Transition Memorandum Report No. 411-TMR-117D; 25 November 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2135. HARBURY, P. L., "The M4500 Spinner for the M2300, M2600, M3000, and M4100 Systems," Radio Research Laboratory Technical Memo No. 411-TM-35. See also Department of Commerce PB14103; 29 November 1944. ABSTRACT: This report describes the M4500 spinner antenna assembly which is used with the M2300, M2600, M3000 and M4100 Direction Finding Systems which enable an observer to determine the direction, sense, polarization, and frequency of a received signal. The spinner is equipped with two antennas, one of which responds to vertically-polarized waves and the other to horizontally-polarized waves. A relay mounted on the spinner enables the operator to switch back and forth from one antenna to the other. (a-3, b-3, c-1, d-1, e-0, f-Description)

2136. AIKENS, A. J., AND CHAPMAN, A. G., "Direction Finding by Improvised Means," Bell Telephone Laboratory, N.Y.C., Project No. 13-101; 30 November 1944. See also NRL Report No. RS 30657. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2137. ANONYMOUS, "Bellini-Tosi Shipboard Direction Finding System According to Specifications of the 'Kriegsmarine' (NVK-GB 39) with a Telefunken Heterodyne Direction Finder Receiver," (German: Kreuzrahmen) See: Department of Commerce PB37124; December 1944. ABSTRACT: A translation from the German explaining the technical components used for the construction of the described equipment. Circuit diagrams are included. (a-3, b-3, c-4, d-4, e-0, f-Description of enemy equipment)

2138. ANONYMOUS, "Handbook of Maintenance Instructions for Radio Compass AN/ARN-11," U.S. Army Air Force Technical Order No. TO-AN-16-30ARN-11-3. See also Department of Commerce PB44646; December 1944. ABSTRACT: Not available. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2139. ANONYMOUS, "List of Luftwaffe Radio Equipment," (German: L. H. S.) See: Air Document Index No. R2657 F593; December 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-German equipment listing)

2140. ANONYMOUS, "Supplement to Description of Radio Set FuG 120. Description of Bearing Recorder, Part of Radio Set FuG 120a," (German: Telefunken) See: Department of Commerce PB L71992; December 1944. ABSTRACT: FuG 120 was modified by substituting a bearing recorder for its telewriter. The bearing recorder works on a similar principle but it indicates azimuth at 30 second intervals. It is accurate to one-half degree and can be used alternatively for reception of text messages. A description is given of mechanical construction of the bearing recorder, with schematic drawings and complete instructions for its operation and maintenance. (a-3, b-3, c-4, d-4, e-0, f-Description)

2141. BERGIN, W. A., "Ground, Mark I, Direction Finder," Signal Corps, 5250th Technical Intelligence Composite Company, Report No. 41. See also Department of Commerce PB L60614; December 1944. ABSTRACT: This report contains a description of a captured Japanese direction finding receiver, its installation, operation, physical and electrical characteristics. A brief comparison is made of the Mark I

and Mark I Mod. 2 equipments. This RDF receiver is an absolute direction finder using a straight cross-H type vertical dipole antenna consisting of four dipoles with 500-ohm feeders to the respective terminals on the antenna turret marked north, south, east, and west. An auxiliary antenna is used with the sense stage. The set receivers both AM and CW signals, a beat-frequency oscillator can be switched into the circuit to assist in locating weak signals. Power for operation of the receiver is obtained from a dynamotor driven by a 6-volt battery. The receiver proper is a conventional type nine tube superheterodyne employing tubes similar to the American 6D6, 6A7, and 37 types. Photographs, drawings, diagrams and charts are included. Illustrations are partly in Japanese. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2142. McPETRIE, J. S., AND SAXTON, J. A., "The Electrical Properties of Soil at Wavelengths of 5 Metres and 2 Metres," JIEE, vol. 92, p. 256; December 1944. ABSTRACT: The paper gives the results of a year's observations on the electrical constants of a grass-covered sandy loam site at the National Physical Laboratory. Measurements of the reflection coefficient of the ground for radiation of wavelength 5 m indicated that the dielectric constant varied between 5 and 25, and that the conductivity varied from 0.7×10^8 to 4×10^8 esu. Measurements of the attenuation in soil were also made at wavelengths of 5 m and 2 mc, and the results indicated similar values for the electrical constants. In a recent paper a description has been given of the determination of the electrical properties of soil at a wavelength of 5 m: the paper covered observations made on a variety of selected sites on different types of soil, and it was shown that the dielectric constant ranged from about 5 to 60, and the conductivity from less than 10^8 esu to not more than 10^9 esu. It was considered desirable to make observations on a fixed site over a period of the order of a year to determine the probable range of variation of the constants on this site. The observations are based chiefly on measurements of the reflection coefficient of the ground: as pointed out later, these measurements give a reasonably accurate indication of the value of the dielectric constant, but are not sufficient to fix the conductivity with the same degree of accuracy. Observations were also made on the attenuation of waves passing through soil, since this is more critical to the value of conductivity and enables the latter to be fixed more definitely. The experimental procedure was the same as that described previously, and consisted in measuring the amplitude of the stationary wave produced directly beneath a horizontal transmitting aerial placed at a height of 12 m above ground. This stationary wave results from the arrival at the receiving aerial of the two rays, one direct from the transmitter and the other after reflection from the ground. The variation in field strength with height was measured by observing the current in a thermo-junction inserted at the center of the receiving aerial, which was arranged horizontally at a series of heights above ground. The receiving aerial was short compared with the wavelength, so that its impedance was largely reactive and dependent to a negligible amount on its height above ground. This condition was verified by observing that the shape of the stationary wave obtained did not change on increasing the length of the dipole by about 30%. Figure 2 shows a typical experimental curve, in which the thermo-junction current is plotted as a function of the height of the receiving dipole above ground, the junction current being proportional to the square of the current in the dipole. The modulus of the reflection coefficient of the ground may be determined from the ratio of the maxima and minima of the standing waves. Any given modulus can be obtained by various combinations of dielectric constant and conductivity. The phase change at reflection also depends upon these quantities, and may be obtained from the positions of the maxima and minima. If these positions are known, together with the amplitude of the stationary wave, the reflection coefficient can be derived and hence the dielectric constant and conductivity are completely determined. (a-1, b-1, c-1, e-5, e-0, f-Theory and analysis)

2143. MOON, J. H., "The Marconator," Marconi Review, no. 75, pp. 17-25; October-December 1944. ABSTRACT: The progressive increase in the speed of modern aircraft demands an equivalent rapidity in the routine work of the air navigator. This in turn requires more rapid operation of the Direction Finder and especially the elimination of any ambiguities which can arise in operation or in applying corrections. This article describes briefly the theory of the "Switched Cardioid" system of reception and also gives details of a concrete design incorporating this and other features which reduce considerably the time required to make use of D/F for navigational purposes. The word "Marconator" is the registered Trade Mark of an aircraft navigational aid recently designed by the Marconi's Wireless Telegraph Co. It is an adjunct to the standard Air Ministry wireless Direction Finding equipment which consists of a rotating loop, a switched cardiod receiver and a Pilot's twin needle Visual Homing Indicator. The principal feature of the Marconator is that it incorporates in one unit the several measuring instruments normally used to determine a W/T bearing. These instruments are coordinated in such a manner that a True Bearing may be read directly from a single cursor without recourse to calibration charts or need for any calculations whatever. This manipulative simplification - as compared with current methods - enables even those new to Direction Finding to obtain more speedy and reliable W/T bearings which, incidentally are automatically corrected for "sense." In consequence of this manipulative simplification the scope of the current apparatus is considerably enhanced and such operations as Straight Track Homing, Flying on a Back Bearing and the determination of Wind Velocities become comparatively simple matters. (a-1, b-1, c-1, d-5, e-0, f-Description)

2144. RAMSAYER, "Automatic Position Indicator for Installation in Pursuit Planes," German; FIAT No. 753:IIIC/1116; December 1944. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2145. ANONYMOUS, "Operating Manual for High Frequency D/F Networks," Electronic Engineering Division, U.S. Coast Guard, Washington, D.C., Report CGC-30; 1 December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

2146. WEHNER, R. S., "Airborne Antenna Design at VHF and UHF," Radio Corporation of America, Camden, New Jersey, OSRD Report No. 4794, OEMsr-1396, Project No. 13-105; 2 December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2147. ANONYMOUS, "Use of Japanese D/F Stations in Early Warning System Current Report," Signal Corps, Enemy Equipment Intelligence Service; 4 December 1944. See also NRL Report No. RS 0013259. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2148. KRAUS, J. D., "Tabulation of Antenna Spinner Assemblies for Group M Direction Finding Systems," Radio Research Laboratory Report No. 411-134. See also Department of Commerce PB14192; 4 December 1944. ABSTRACT: This brief report contains a list and chart which have been prepared in order to assist in the identification of the various types of antenna spinner assemblies, development or under development by Group M for use with the Group M Direction-Finding System. (a-3, b-3, c-1, d-1, e-0, f-Report)

2149. ANONYMOUS, "XPB4Y Airplane AN/APA-24 and AN/ARR-5 Equipments - Installation and Flight Tests of," U.S. Naval Air Station, Patuxent: Report No. TED PTR 31492.9; 7 December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2150. ANONYMOUS, "Installation Specifications for Model AN/APA-17 Airborne Direction Finder Equipment," U.S. Navy, Bureau of Aeronautics. See Department of Commerce PB13600; 9 December 1944. ABSTRACT: The purpose of this specification is to give in detail BuAer requirements and other information necessary for completing a satisfactory installation of the AN/APA-17 airborne direction finding equipment in aircraft for which it is specified. Electronic equipment list and drawings are included. (a-3, b-3, c-1, d-1, e-845, f-Specifications)

2151. BUSIGNIES, H., "Applications of High Frequency Solid Dielectric Flexible Lines to Radio Equipment," Federal Telecommunications Laboratories, Nutley, N.J.; 11 December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2152. DIGIACOMO, A., AND PETERSON, G., "Radio Set AN/CRD-3 and Radio Set AN/CRD-3 (XO-1)," Signal Corps Engineering Laboratories, Eatontown, Penna., ESL Report No. ST-19; 12 December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2153. KANDOIAN, A. G., "Some Special Problems in the Use of Dielectric H. F. Cables," Federal Telephone and Radio Corporation Nutley, N.J., Technical Memo No. 98; 12 December 1944. ABSTRACT: In this discussion the attenuation problem is of primary interest. Several special cases are analyzed to show how the appreciable attenuation of the solid dielectric cable affects the results. (a-4, b-3, c-1, d-1, e-88, f-Analysis)

2154. ALFORD, A., ET AL., "Preliminary Instructions for M4100 Direction Finder (Navy DBM)," Radio Research Laboratory Instruction

Book No. 411-IB-54. See also Department of Commerce PB14378, p. 71; 14 December 1944. ABSTRACT: This handbook, prepared at Harvard University under contract with NDRC, presents a detailed description of DBM components, operating procedure, installation and maintenance data. Photographs and diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Description)

2155. PICKERING, W. H., DAVID, J., AND HORNYAK, W. F., "Radio Direction-Finding at a Wavelength of 1.8 Meters," Proc. Amer. Phys. Soc., Pasadena, Cal. 16 December, 1944. Abst. in Phys. Rev. vol. 67, p. 66; January 1 and 15, 1945. ABSTRACT: The accuracy attainable with an Adcock type aerial was investigated. Attention is directed to bearing errors due to polarisation of the transmitted wave and to nearby objects behaving as parasitic radiators. The aerial consisted of 2 vertical quarter-wave rods spaced 3/4λ. The effects of various types of earthing plane are investigated. With favourable conditions, an accuracy within 0.2° is attainable, but polarisation errors may be 10°. For best determination of the null direction, the receiver output is recorded on a paper strip synchronised with the rotation of the aerial. (a-6, b-1, c-1, d-1, e-0, f-Experimental investigation)

2156. ANONYMOUS, "Radio - Direction Finding - Elimination of Intermodulation Interference in Model DAJ High Frequency Direction Finder at San Juan, Puerto Rico - NRL Problem S618R-C - Design Filters for, Final Report," NRL Letter Report No. C-S67/69(342a) C-342-39; 18 December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2157. ANONYMOUS, "Radio - High Frequency Direction Finder - Model DAQ in USS TINSMAN, DE 589 - Sense Action of," NRL Letter Report No. C-S67/69(342 LFTC) - C342-43; December 1944. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2158. FRINK, F. W., "Description of CXGJ and CXGJ-2 Receivers," Federal Telecommunications Laboratories, Nutley, N.J., Technical Memo No. 100; 22 December 1944. ABSTRACT: The CXGJ-2 receiving and direction finding system is designed for use on military aircraft, in the frequency range 20-100 mc, for the purpose of searching for signals, monitoring received signals, and determining the direction from which the signals are being received. The searching for signals is accomplished by means of the scanning feature of the receiver. This report describes how this receiver functions. (a-1, b-3, c-1, d-1, e-90, f-Technical memo)

2159. TAYLOR, H. C., "Spot Report on German Radio Direction Finder Fu. P. Ger. a/b," Signal Corps, Enemy Equipment Intelligence Service Report No. 2. See also Department of Commerce PB31066; December 1944. ABSTRACT: This report briefly describes a mobile radio direction finder in the frequency range of 75 to 3750 kc in 6 bands. The complete set consists of a receiver, battery box, a "commando" or liaison set, a mobile trailer or tent, a ten-meter extension mast, and accessories. It is designed to give accurate compass bearings (azimuth) on a signal of known frequency. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

1945

2160. ANONYMOUS, "German D/F Equipment," U.S. Army Signal Corps. See Department of Commerce PB1611; 1945. ABSTRACT: Details of German direction-finding equipment and technique, the information being derived almost entirely from captured documents and covering loop sets. Adcock systems of the manually rotated type and crossed Adcock systems working into both manually and mechanically operated goniometers. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2161. ANONYMOUS, "Handbook of Maintenance Instructions for Model AN/APA-24 Direction Finder Antenna System," U. S. War & Navy Departments and Air Council of the United Kingdom. See Department of Commerce PB15065; 1945. ABSTRACT: The purpose of the Airborne Direction Finder Antenna System is homing or direction finding on intercepted signals ranging in frequency from 100 to 750 megacycles. The direction of the intercepted signal is established by rotating the antenna until the point of minimum signal is obtained. In operation the Antenna System is connected to a Radio Receiver having suitable frequency range and sensitivity. Either headphones, an oscilloscope, or both, are connected to the Receiver output. The Model AN/APA-24 Direction Finder Antenna System is composed as follows: A horizontal dipole and two phased vertical dipoles spaced 1/2 wave apart (Adcock) are mounted on a rotatable shaft. Both of the dipole systems are mounted symmetrically about the antenna shaft with the supporting member for the vertical dipoles placed at 90° to the horizontal dipole. The antenna shaft is housed within and supported by a streamlined strut, which is mounted rigidly to the aircraft. A Hydraulic Control System, with a transmitter located at a point remote from the antenna, and a receiver located at the base of the antenna supporting strut to drive the antenna shaft, permits the Operator to rotate the antenna approximately 100° each side of the longitudinal axis of the aircraft. The Antenna System gives equal response to a given signal strength on beams that are 180° apart and thus commands 360° of azimuth with 180° mechanical rotation. An Autosyn System, with the transmitter installed so as to be driven by the rotation of the antenna shaft, indicates to the Operator the position of the antenna relative to the longitudinal axis of the aircraft. Such position is shown on an Autosyn indicator, which may be located at a point remote from the antenna. Cables from the two elements of the antenna are connected by means of two splicing connectors to an Impedance Matching Switching Unit, which contains a switch for selecting either the horizontal dipole or the vertical dipole (Adcock) antenna element for connection to the Radio Receiver. Four Antenna Assemblies are supplied as part of this equipment. Corresponding Impedance Match Switching Units are likewise supplied as part of this equipment. The proper Antenna Assembly and its corresponding Impedance Matching Switching Unit are installed in the aircraft, depending on the frequency range coverage desired. The direction of the intercepted signal is established when the signal strength is at a minimum, or null point. The null point of the horizontal dipole is attained when this dipole is pointing to the direction of the signal. The null point of the vertical dipoles (Adcock) is attained when the supporting member for these elements is at right angles to the line of the intercepted signal. Therefore, when the null point has been established the direction of the intercepted signal can be read directly from the antenna regardless of whether the horizontal dipole or the vertical dipoles are being used. The antenna position for such a signal condition is indicated to the operator by the Autosyn System. Rotation of the antenna to establish the null point of the intercepted signal is accomplished through the operation of the Hydraulic System. The horizontal dipole responds to an intercepted signal polarized in the horizontal plane or in any plane between the horizontal and 60° to the horizontal. The vertical dipoles respond to intercepted signals which are polarized in any plane between the vertical and 45° to the vertical. (a-1, b-3, c-1, d-1, e-845, f-Instructions)

2162. ANONYMOUS, "Japanese Power Frequency Direction Finder Type 98," Evans Signal Laboratory Report. See Department of Commerce PB1567; 1945. ABSTRACT: This report describes in detail equipment for locating 60 cycle power lines. The range at best is not over 2 miles. Construction is good. Countermeasures are described. Photographs of the equipment are given. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2163. ANONYMOUS, "Radio Applications, Radar," Third Commonwealth and Empire Conference on Radio for Civil Aviation, C.E.R.C.A., vol. 45, no. 21, His Majesty's Stationery Office, London; 1945. ABSTRACT: A detailed official report of the conference held under the auspices of the Ministry of Civil Aviation. The main recommendations can be summarized under the following headings: (a) Proposals for civil radio airworthiness requirements. A specification was adopted and will be recommended for international approval. (b) Preferred standards for radio cases and mountings and aircraft radio power supplies, also covering such items as plugs and sockets, coding of wiring, etc. Recommendations to the International Air Transport Association. (c) Radio systems for immediate installation on international air routes. Detailed recommendations concerning equipments for communication, aids to navigation, aids to final approach, airways and area control, collision warning, approach and airport control and aids to rescue operation. (d) Services required of standard radio aids, this being mainly a requirement (operational) specification for the devices described under (c). (e) Radio systems recommended for international standardization. General suggestions on the devices described under (c), but not available for immediate installation. (f) Proposals for aeronautical frequency allocations, covering pulsed radar navigational aids, localizer and glide-path frequencies, radio altimeters, etc. (g) Draft programme of radio development for civil aviation. Allocation of future development work to the participating countries. Agreement was also reached on the examination, certification and licensing of aircraft radio technicians and operators. (a-3, b-1, c-1, d-5, e-0, f-Report)

2164. ANONYMOUS, "Status of High-Frequency Developments at Telefunken," (German: Telefunken) See: Field Information Agency, Technical, Joint Intelligence Objectives Agency, Section No. 677, Report No. 176; 1945. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2165. ANONYMOUS, "Technical Report on UKW PE e 1 Direction-Finding Receiver," Enemy Equipment Intelligence Service Report

No. 9-18, Hdq. 9th Army, Detachment No. 9. See also Department of Commerce PB1585; 1945. ABSTRACT: Description of direction-finder receiver used to direction find Radio Sonde equipment. It is a 7 tube superheterodyne operating in the frequency spectrum of 83 to 100 mc/s. It is battery operated and easily portable, well constructed and compact. Sensitivity and selectivity are good. No comparison was made with U.S. Army equipment. Details of technical characteristics and operation of equipment are given. The report includes a photogram and diagram of equipment. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2166. ALPERT, J., AND GOROZHANKIN, B., "Experimental Investigation of the Structure of an Electromagnetic Field over the Inhomogeneous Earth's Surface," J. Phys., U.S.S.R., vol. 9, no. 2, pp. 115-122; 1945. ABSTRACT: The phase structure of the field over a stretch of sea near a hilly coast is investigated by a radio interferometer and a direction finder. The results are plotted as contours of equal phase velocity and show variations of as much as 0.5% in some directions at distances up to 5λ from the radiator. At distances of the order of 8λ, for all directions, the phase velocity approximates to c. The direction-finding errors are of different sign according to the angle of the shore line, whereas most workers have indicated that the sign of the coastal error must always be negative. (a-6, b-1, c-2, d-2, e-0, f-Analysis)

2167. BUTTNER, H. H., "Flight Test of Navy Type X-DBA Radio Direction Finder on B-24J Aircraft," National Defense Research Committee Report No. 936-4. See also Department of Commerce PB14348; 1945. ABSTRACT: The series of tests described in this report were conducted for the purpose of determining the feasibility of using a type X-DBA Radio direction finder on a B-24J bomber. The component parts of the direction finder are given, and results of tests shown in four graphs. Data secured during these tests indicate that less accuracy in the bearing pattern can be expected as the frequency is increased. (a-3, b-3, c-1, d-1, e-0, f-Test Report)

2168. DEUTSCHE REICHSPOST, "Telecommunications and Ionospheric Research," British Intelligence Objectives Sub-Committee, Microfilm Reel No. FD 734/46, Frames 1-303; BIOS/DOCS/ 134 X; See also Department of Commerce PB L90173; 1938-1945. ABSTRACT: Microfilm reel containing 269 frames of interest, contains both English and German. (a-4, b-3, c-1, d-5, e-0, f-Microfilm documents)

2169. KING, R. W. P., MIMNO, H. R., AND WING, A. H., Transmission Lines Antennas and Wave Guides, McGraw-Hill Book Company, Incorporated, New York City; 1945. ABSTRACT: Included in this book is a brief mention of direction finding. (a-4, b-6, c-1, d-1, e-0, f-Reference book)

2170. KOEHLER, H. W., "Horizontal Field Patterns of Very-High Frequency Unsymmetrical Localizer Antenna Arrays," Civil Aeronautics Administration, Technical Development, Report No. 36; 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2171. LORENZ, C., "Radio Direction Finders, Beacons, Etc.," (German: A.G., Berlin-Tempelhof); FIAT Microfilm Reel No. B-323, Frames 2681-3306; See also Department of Commerce PB L74005; 1941-1945. ABSTRACT: This FIAT Microfilm reel consists of pamphlets and manuals on radio and radar direction-finding and landing equipment and radio beacons. The manuals contain descriptions, operating and maintenance instructions, photographs, drawings, parts lists, wiring and circuit diagrams. Individual items are listed and are available separately by frame number groupings. No translations; all content is in German. (a-4, b-3, c-4, d-4, e-0, f-Microfilm documents)

2172. MARCHAND, N., "Special Aspects of High-Frequency, Flexible Balanced Cables," Federal Telephone and Radio Corporation, Newark, New Jersey, Technical Information Series; 1945. ABSTRACT: This paper discusses the construction of a number of different types of solid dielectric flexible balanced cables, some advantages and disadvantages in their use, and a number of testing methods that have been used in their production. (a-4, b-3, c-1, d-1, e-174, f-Fabrication)

2173. MEYER, "Report on Experiments and Present State of D/F Gear," (German: N.V.K.); 1945. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2174. MULLET, L. B., ET AL., "Report on the Fernmeldetechnisches Entwicklungslaboratium and Interrogation of Dr. H. Kimmel," Department of Commerce PB76, 1945. ABSTRACT: Account of work being done by Kimmel at Olching (near Munich). He was mainly concerned with design and small-scale production of test and measuring gear; RC oscillator, pulse and signal generators, high frequency attenuator, absorption wavemeters, diode voltmeters, calibrated receivers. Other problems worked on by Dr. Kimmel were: a proposed AL aerial system; direction finding system known as "Susel"; regulated output receivers; indicator for 50 c/s phase difference measurements; and a time modulation system. (a-3, b-1, c-1, d-1, e-0, f-Research report)

2175. SMITH, E., "Instructions Book on the M-2617 Spare Parts for Replacement in M-2600 Direction Finding Equipment," Radio Research Laboratory Report No. 411-IB-38A (Supplement to No. 411-IB-38, dt'd; 26 June 1944. See also Department of Commerce PB1449; 1945. ABSTRACT: This document lists the parts of the M-2600 direction finding equipment which have the shortest life and for which replacements are available; it contains instructions as to time and method of replacement of such parts. (a-3, b-3, c-1, d-1, e-0, f-Instruction)

2176. SMITH-ROSE, R. L., "Radiolocation-II, History of Its Development," National Physical Laboratory (British). See Wireless World, pp. 66-70; 1945. ABSTRACT: The technical information contained in this article was released by British censorship. In view of the fact that the U. S. War Department has not yet permitted an official release on the subject of radar, none of the facts in this article are to be construed as relating to American equipment. Radar had its origin in the research incident to the discovery of the Heaviside layer during the years 1924 and 1925. Altimeters were made which used reflected radio waves to measure the altitude of an airplane. The beginning of true radar dates from the observation that an airplane flying near a transmitter caused "beats" in the received message. On a wavelength of 5 meters over a path 12 miles long, the amplitude of the beat varied from about ± 1/2 db up to 10 db on some occasions, and at all times when this occurred an aircraft was found to be flying at various distances up to 2-1/2 miles away and at heights up to 500 ft. The period of the beats varied from 5 to 15/sec; and that is to be compared with the calculated value of 11/sec for an aircraft flying directly toward the receiving aerial at a speed of 60 mph. It was clearly established 10 years ago that radio waves reflected from aircraft in flight could be detected with suitable receiving equipment on the ground. The paper traces the history of radiolocation to the beginning of the present war, reviewing the work done, as far as is known, in all of the leading countries of the world. (a-1, b-1, c-1, d-5, e-0, f-Study)

2177. U.S. SIGNAL CORPS, "Reports on Aerology, Airborne Radar Development, Direction Finding, etc. 1941-1945," Department of Commerce PB84898; 1945. ABSTRACT: 1262 Frames, with text in German. This microfilm reel contains the following material: (a) reports on aerology; (b) reports on airborne radar development and tests; (c) an English translation of a dissertation entitled "speed of propagation, characteristic impedance and damping of electromagnetic waves in dielectric cylinders" and an article from the Reichsamt für Wetteldienst on direction finding of atmospheric disturbances for meteorological purposes. Micro SIG IS 15. (a-3, b-3, c-4, d-4, e-0, f-Microfilmed reports)

2178. U.S. SIGNAL CORPS, "Technical Manuals Dealing with Aircraft Radio and Radar Equipment," Department of Commerce PB84887; 1945. ABSTRACT: 1589 Frames; This microfilm reel contains technical manuals for the Fu G 102A, 212, 216, 217 and 220 aircraft radio equipment and for the "Dete II" and "Wassermann" airborne radar equipment, as well as reports on the "Neptun" airborne radar and the "Nürnberg" and "Gleichenberg" procedures. Micro SIG IS 4. (a-3, b-3, c-4, d-4, e-0, f-Microfilmed reports)

2179. ANONYMOUS, "Airborne Radio Apparatus FuG 24," (German) See: Air Document Index No. R2097 F356; January 1945. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2180. ANONYMOUS, "DF Adapter for Monitor Receiver FuG 351, Korfu," (German: Blaupunktwerke) See: Air Document Index No. R4005 F208-229; January 1945. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2181. ANONYMOUS, "Japanese Electronics - Radar, Radio Direction Finding, Navigational Aids," USN, Navy Operations, Photo Intelligence, Report No. 16; January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

2182. ANONYMOUS, "List of Naval Radio, Radar, and Sonar Equipment Arranged by Navy Model Number," USN, BuShips: 242A; January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Index)

2183. ANONYMOUS, "Preliminary Instruction Book for C2100G Direction Finder," Radio Research Laboratory Report No. 411-1B-9D, See also Department of Commerce PB14414; January 1945. ABSTRACT: This report contains sections on general description, installation and adjustment, operation, theory of operation, and maintenance of this equipment. This airborne direction finder is designed to give sharply defined null directional characteristics on signals of either horizontal or vertical polarization over a frequency range of 60 to 750 mc. Photographs of parts, schematics, block diagrams, azimuthal patterns, a table of replaceable parts are included in this publication. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2184. BOVILL, C. B., "Aircraft D/F Equipment; Recent Developments," Wireless World, vol. 51, pp. 14-16; January 1945, and pp. 39-42; February 1945. ABSTRACT NO. 1: Describes a typical aircraft D/F using a loop and a sense antenna for unilateral bearings. Presentation of bearings is visual using crossed meter needles or a cathode-ray tube. ABSTRACT NO. 2: A switched cardioid system is usually employed with a receiver of very high sensitivity but the installation is still subject to several inherent errors. Recent improvements include the use of the gyro-magnetic master compass which is highly accurate and can be placed in any part of the aircraft. Visual indication of loop nulls is used as high noise level prohibits aural detection. The "Marconator" of Marconi's Wireless Telegraph Co. is a semi-automatic direction finder with a high mechanical accuracy. Bearings can be taken with high precision in a very short time due to the elimination of several operations necessary with standard D/F equipment. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

2185. BRAAKE, "Installation of Directional Loop Antenna Pr-15 Ln 28 699 for Aircraft," (German: Lorenz) See: Air Document Index No. R2886 F812; January 1965. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2186. BUYS, W., "Aerials," Tech. Wet. Tijdschr., vol. 14, pp. 6-13, 29-41, and 63-72; January-March, April-June, and July-September 1945. ABSTRACT: Summarizes theory and practice up to year 1941. (a-6, b-1, c-7, d-0, e-0, f-Survey)

2187. COOPER, V. J., AND GREEN, E., "The Design of Directional Aerial Arrays," Marconi Review, vol. 8, no. 76, pp. 12-23; January/March 1945. ABSTRACT: Concluding part of article dealing with a method of designing aerial arrays to give predetermined polar curves of field strength. For previous portion of report, see No. 67 of 1945. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

2188. MACKINTOSH, J. E., "Report on Flight Tests Carried Out on U.H.F. C/R D/F Equipment Type FV5 at R.A.F., Waddington," Royal Aircraft Establishment, Ministry of Aircraft Production(British) Report: Technical Note No. RAD265, January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2189. MARTIN, D., "Medium Frequency D/F Antenna," Bendix Radio Engineer, vol. 1, no. 3, pp. 1-4; January 1945. ABSTRACT: Description of modified spaced loop antenna system which eliminates polarization error in ground station direction finding at medium frequencies. (a-3, b-2, c-1, d-1, e-0, f-Description)

2190. RÜDENBERG, R., "Grounding Principles and Practice, I-Fundamental Considerations on Ground Currents," Elect. Engng., vol. 64, no. 1 pp. 1-13; January 1945. ABSTRACT NO. 1: An analysis of the behavior of earth currents as influenced by soil resistivity, current frequency, and size and shape of the electrodes. Parts II-V of this article appear in the February-May issues of the same publication, and deal with power-engineering aspects of the subject of grounding. ABSTRACT NO. 2: Expressions are developed for the resistance of simple geometric shapes of single and multiple electrodes and for the field surrounding them. In considering soil heating the steady state and transient condition are treated separately. The effect of conductors such as pipes in extended earth fields is considered, and the impulse characteristics of driven rods and buried wires are calculated. (a_1-6, a_2-3, b-2, c-1, d-1, e-0, f-Analysis)

2191. HORNER F., "Scattering of Radio Waves by Metal Wires and Sheets," National Physical Laboratory(British) Report No. RRB/C.110; 1 January 1945. See also Proc. IEE (London) Part III, vol. 96, pp. 333-340; July 1949. ABSTRACT NO. 1: The paper describes an experimental determination of the usefulness and limitations of elementary theory in estimating scattered fields from metal wires and sheets, treated as passive scattering elements. This problem is of interest in assessing site errors in direction finding. Formulae are derived for the scattered fields using the transmission line equations for wires and simple diffraction theory for sheets. A method is described for the measurement of scattered fields. A conventional rotating-H Adcock direction finder is used and results at a wavelength of 30 cm are shown to be in fair agreement with the elementary theory. The results indicate that at wavelengths of this order it will, in general, be permissible to neglect resonance effects in sheets greater than a wavelength in width, normal to the electric field, and in wires more than a few wavelengths long, if they are not very thin. It is concluded that scattered fields may normally be computed from elementary theory to an accuracy sufficient for site error work. ABSTRACT NO. 2: Formulas for the scattered fields are derived, using transmission-line theory for wires and diffraction theory for sheets. Measurements of the scattered fields have been made at a frequency of 600 mc, using a direction finder as the indicating instrument; the results are in substantial agreement with theory. For wires of the order of 1 mm in diameter and more than 5λ long, resonance effects at 600 mc are small. Such effects are negligible in sheets whose dimension normal to the electric vector is greater than λ. (a_1-1, a_2-6, b-1, c-1, d-5, e-142, f-Reradiation)

2192. ANONYMOUS, "Radio - Direction Finding - VHF Short Type 20-100 MC, - Model XCZ Development of - NRL Problem S989R-C-Interim Report on," NRL, Letter Report No. C-S67/69(342g)C-342-169; 3 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2193. ANONYMOUS, "Tests of Loop Antenna Adaptation to Loran," NRL, Letter Report No. C 342/12-8; 3 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2194. ANONYMOUS, "Germany - Communications - Captured Enemy Document Direction Finding System," NRL Report No. RS 027229; 7 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

2195. ANONYMOUS, "Preliminary Instruction Book for the C2121/C2122 Adapter Kit for C2100 Direction Finder," Radio Research Laboratory Report No. 411-1B-9B. See also Department of Commerce PB14413, 8 January 1945. ABSTRACT: The C2121 adapter kit contains an electric motor drive unit to replace the hydraulic drive, a transformer and switch unit to cover the range 60 to 450 mc, and extension rods to widen the range of the low frequency antenna down to 60 mc for the C2100 direction finder equipment. The C2122 kit is the same as the above except that it includes a second transformer and switch unit for the frequency range 100 to 750 mc. The instruction book contains information on installation, operation, theory, and maintenance of these modification kits, and is illustrated with photographs, schematics, and drawings. The instructions also contain information on the operation of the assembled C2100 airborne direction finder. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2196. ANONYMOUS, "Radio Set SCR-502," US Army, War Department, Technical Manual No. 11-256. See also Department of Commerce PB21918; 8 January 1945. ABSTRACT: Radio set SCR-502 is a semi-portable radio direction finder (RDF), designed for ground station operation The frequency range is from 1.5 to 30 mc, using two fixed U-Adcock antenna arrays. Instantaneous visual azimuths are indicated on the screen of a 5-inch cathode-ray tube by means of deflection coils driven in synchronism with the motor-driven goniometer. Provision is made for simultaneous aural monitoring of the received signal. Azimuths may be read directly from the illuminated 360° azimuth scale, for both cw and am signals. The manual contains sections on description, installation and operation, functioning of parts, maintenance, and supplementary data. It is illustrated with photographs, drawings, and diagrams. (a-3, b-3, c-1, d-1, e-0, f-Manual)

2197. CARTER, P. S., "Circular Loop Antennas at High Frequencies," Radio Corporation of America, Camden, New Jersey, Report 895-31; 10 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2198. WHITBY, O. W., "Test Report (Field Division) Flight Tests of an AN/APA-24 Antenna with Electric Drive," Radio Research

Laboratory Report No. 411-TR-49, 11 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test. See also Abstract No. 2220)

2199. ANONYMOUS, "Installation, Orientation, and Operation of the German Radio Direction Finding Receiver E. P. 2a," (German:GLZ) See: Department of Commerce PB2316; 15 January 1945. ABSTRACT: This report consists of 5 reports of the Technical Liaison Division: 1. Installation, orientation, and operations of the German radio direction finding receiver E.P.2a. 1945. 12 pages, including diagrams. 2. German ground VHF intercept receiver, FuHEv (Serial #1612/brd/42). n.d. 8 pages, including 6 photographs and circuit diagram. 3. Translation of technical manual D782/5 on operation and maintenance of field relay repeater. 1944. 9 pages, including photographs and diagrams. 4. German mine detector, Berlin 40 Type B Nr. 0480; manufacturer unknown. 1944. 6 pages, including photographs and wiring diagram. 5. German replacement part kit for field telephones and switchboards. 1944. 4 pages, including photographs. (a-3, b-3, c-4, d-4, e-0, f-Enemy equipment)

2200. ANONYMOUS, "Radio - Direction Finding - Malfunctioning of Automatic Direction Finders with ASE, ASB, ASD, ASG-NRL Problem A14R-APS - Priority A-3, Interim Report Covering ASB Interference," NRL, Letter Report No. C-S67/69(342a:RAP)C-342-108; 15 January 1945: ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2201. ANONYMOUS, "Proposal for UHF/DF for Use with MAR or RDR Equipments," Radio Corporation of America, Camden, New Jersey, Proposal No. AS-5894-G; 17 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2202. ANONYMOUS, "Aviation Radar - V.H.F. Cathode Ray Direction Finding Equipment Type FV5," USN, Naval Air Attache, London, Report No. A-353-S-45; 20 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2203. ANONYMOUS, "Interim Development Report on Improvement of Sense Operation Model DAQ," Federal Telecommunications Laboratories, Nutley, New Jersey, Report: TM 99, 99A, and 99B; 25 January 1945. ABSTRACT: The reports give a resume of tests performed in relation to sense problems with the DAQ equipment. (a-4, b-3, c-1, d-1, e-89, f-Resume)

2204. HARBURY, P. L., "Instruction Book for the M4502, M2300, M4504, M3000 (AN/APA-17) Systems," Radio Research Laboratory Instruction Book No. 411-IB-51; 25 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2205. ANONYMOUS, "German Radio Direction Finder Fu.P. Ger. a/b Manufacturer: probably Lorenz, 1942, Frequency Range 75 - 3,750 Kcs. 4000 - 80 Mtrs," Signal Corps, Enemy Equipment Intelligence Service, Report No. 11; 27 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, d-1, e-0, f-Enemy equipment)

2206. ANONYMOUS, "Japanese Radar and D/F Installations," Joint Electronics Intelligence Agency, Report No. 7488; 31 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2207. ANONYMOUS, "Radio - Direction Finding - Installation of Model DBF in a DAW Mobile Trailer - NRL Problem S408.1T-C - Priority A-1 - Final Report on," NRL, Letter Report No. C-S67/69 (342f)C3420164; 31 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2208. ANONYMOUS, "Specification of Atmospherics Direction Finder, N.P.L. Pattern Mark II, National Physical Laboratory (British) Report; 31 January 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

2209. HORNER, F., "Some Experiments on the Accuracy of Bearings Taken on an Aural-Null Direction Finder," National Physical Laboratory (British) Report No. RRB/C.12; 31 January 1945. ABSTRACT: Not available. (a-4, b-3 c-1, d-5, e-0, f-Experiment)

2210. ANONYMOUS, "Comparison of High Frequency Potentiometers for Testing Goniometer Accuracy," Federal Telecommunications Laboratories, Nutley, New Jersey, Technical Memo No. 111; ca February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-92, f-0)

2211. ANONYMOUS, "Radio as a Means to Flying Safety," (German) Halle A.D. Saale, Luftnachrichtenschule, See Department of Commerce PB51280; February 1945. ABSTRACT: Seven different methods to determine plane position, airfield location, or direction are described in summary fashion and explained with the help of diagrams and illustrations. (a-3, b-3, c-4, d-4, e-0, f-Instructions)

2212. ANONYMOUS, "Radio Equipment for the Me 262," (German: Messerschmitt) See: Air Document Index No. R2604 F277; February 1945. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

2213. ANONYMOUS, "Radio Set SCR-658," U.S. Army, War Department Technical Manual 11-1158A, See also Department of Commerce PB41255; February 1945. ABSTRACT: Radio set SCR-658 is a portable meteorological radio direction finder designed to operate as part of a system to secure wind direction and speed. When used with a frequency modulated radiosonde, the system also furnishes data concerning humidity, temperature, and pressure at various altitudes above the ground. A directional antenna, antenna switch, a portion of the receiver, and the cathode-ray tube indicator make up the RDI portion of the radio set. To obtain the humidity, pressure and temperature data, the output of the f-m channel of the receiver is fed to the external radiosonde recording equipment where the results are recorded on a moving paper chart. The receiver has a tuning range of 387 to 407 megacycles, with the normal operating frequency of the system at 397 mc. This equipment may be operated from any 115 or 230 volt, 50-70 cycle a-c source. Photographs, drawings, charts, diagrams and a parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2214. BOVILL, C. B., "Aircraft D.F. Equipment: The 'Marconator'," Wireless World, vol. 51, pp. 39-42, February 1945. ABSTRACT: Describes the "Marconator" which is a typical rotated-loop type d.f. with cam correction for quadrantal error. Automatic insertion of the plane's true bearing is provided to give the operator a direct reading of the true bearing to the transmitter. (a-6, b-1, c-1, d-5, e-0, f-Description)

2215. GOLDSTEIN, M. K. AND GREEN, J. W., "Report on the Flight Investigations of Suitable HF/DF Collector Locations on a PV-1 Navy Patrol Bomber," NRL Report No. R-2469. See also Department of Commerce PB2872; February 1945. ABSTRACT: This report evaluates the suitability of available collector locations for a spinning loop type of high frequency direction finder Model XCM (1.5 to 30 mc/s) on a PV-1 aircraft. One topside and one bottomside location for the HF/D/F collector were considered practical and D/F calibrations were obtained for both locations over the complete frequency range. In both locations, good D/F bearing curves were obtained from 1.5 to 6 mc/s while erratic bearing behavior occurred from 6 to 30 mc/s. The erratic behavior was attributed to electrical resonances of the aircraft structure and to the fixed topside service antenna resonating within the 6 to 30 mc/s frequency range. The corrective recommendations are also given in the report. A diagram of the bomber and graphs are included. (a-3, b-3, c-1, d-1, e-0, f-Report)

2216. BRAY, W. I., LILLICRAP, H. G., AND EWEN, A. B., "The Experimental Use of an Aperiodic Capacitive Radiogoniometer with a Remote Crossed-Loop D/F Aerial, Frequency Range 300 - 600 Kc/s," General Post Office (British) Radio Report No. 1284; 2 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-32, f-0)

2217. ANONYMOUS, "Radio - Direction Finding - Contract NXsr-45457 - Direction Finder for Marine Corps Reconnaissance Cars - Comments on - NRL Proposed DAX Tests," NRL Letter: No. C-S67/69(342: ATY)C-342-81; 3 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2218. CLARK, T. H. "Model Day Direction Finder," Federal Telecommunications Laboratories, Nutley, N. J., Technical Memo.: No. 110; 4 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-91, f-0)

2219. WHITBY, O. W., "Flight Tests of an AN/APA-24 Antenna

with Electric Drive," Radio Research Laboratory Report No. 411-156. See also Department of Commerce PB14208. 5 February 1945. ABSTRACT: This report contains the results of approximately ten calibration flights made with AN/APA-24 (D/F) antennas, especially modified by the RRL for electric motor drive. These units were modified so as to replace the hydraulic drive with an electric one, and so that they could be retracted against the underside of a B-24 aircraft. As well as flying clover-leaf patterns to get the bearing errors of the antennas on horizontally and vertically polarized radiation at 100 and 200 mc, considerable experimentation with the motor drive was undertaken. The results of the antenna calibration tests and those on the motor drive lead to the conclusion that the electric drive is much better than the old hydraulic system, but, if the full advantages of the freedom from error of the bottom-mounted antenna are to be realized, a more refined method of controlling the antenna's direction is needed. A type of d.c. servo system is suggested for this, and several recommendations for improving the mechanical constructions of the antenna and its mount are set forth. Finally, some additional tests, that are needed to complete the work on the antenna, are mentioned. (a-3, b-3, c-1, d-1, e-0, f-Test; See Abstract No. 2198)

2220. ANONYMOUS, "Homing on Transmissions in the Frequency Band 1500 - 10,000 Mc.s," Radio Countermeasures Board, (British) Joint Electronics Intelligence Agency Report No. 8005; 7 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2221. ANONYMOUS, "Radio - Model DAW-2 - Report on Results Obtained with," U.S. Navy, Bureau of Ships; 8 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2222. ANONYMOUS, "Radio - Direction Finding - Model DBF Tests in USS Bennington (CV20) - Report on," NRL, Letter No. C-S67/69(342 MJS)C-342-137; 9 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2223. BRICE, D., "Blind Approach Systems," Aeroplane: pp. 165-167; 9 February 1945. ABSTRACT: A description of the Standard Beam Approach, which is one of the most successful methods of blind approach and landing. The Radio Range and Radio Compass are also briefly described, and it is suggested that radar and other war equipment will do much to increase reliability of air transportation. With the S.B.A. equipment described (made by the Standard Electrical Company and used by the RAF), a safe landing can be made with a horizontal visibility of 100 yd and a cloud base of 100 ft. It consists of three radio beacons and a visual dashboard indicator. The Main Beacon and Inner Marker Beacon are at the ends of the runway and an Outer Marker Beacon is located two miles past the inner marker. The Main Beacon transmits (through vertical aerial and reflectors) dots on one side and dashes on the other side of the approach. The signals combine to form a 2-1/2° to 4° approach beam. A set of maneuvers in combination with the radio signals enable the pilot to pass over the airport, turn, reapproach accurately, and land safely. The illustration shows one approach. Detailed instructions are included in the article. (a-3, b-1, c-1, d-5, e-0, f-Description)

2224. ANONYMOUS, "Additional Information on German Direction Finding Receivers E.P.2a and TP(LM)6/315: Comparison with SCR-206 in Tactical Operation; Adaptation for Use in Truck; Translation of Technical Manual on E.P.2a," Signal Corps; Enemy Equipment Intelligence Service Report No. 10-5.1; 11 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

2225. ANONYMOUS, "International Negotiations Re: Establishment by USN of Direction Finder Network," U.S. Navy, Counselor of U.S. Embassy, Ottawa, Canada; 12 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

2226. COWAN, C. L. AND PAGEL, H. J., "A Visual Display System for CSB (Close Support Unit)," Massachusetts Institute of Technology, British Branch, Radiation Laboratory, Reference No. 74; 12 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

2227. KILPATRICK, E. L., "Navy Type DAB-3 High Frequency Direction Finder; Observed Bearing Errors," US Coast Guard: Report No. 815; 12 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

2228. ANONYMOUS, "Navigational Aids Available to G. B. Flying Boats Bases in S. Ceylon and the Island Bases: A Survey of Their Present Use and Limitations with Possible Development," Army Air Force, Headquarters, S.E. Asia Ceylon: Operations Research Section. See also NRL Report No. RS 0014488; 14 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-Survey)

2229. ANONYMOUS, "Radio - Direction Finding - Medium Frequency Model DAK-3 Performance Investigation of Installation on the USS SEMMES (AG24) - NRL Problem S801R-C - Priority A-1 - Report on," NRL, Letter Report No. C-S67/69(342:SRG)C-340-28/45; 15 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2230. FOSTER, D., "The Use of Continuously Rotating Direction Finders against Signals of Varying Intensity," Radio Research Laboratory Report No. 411-158. See also Department of Commerce PB14210; 17 February 1945. ABSTRACT: Direction finders with continuously rotating antennas and azimuthal scope presentations are inaccurate when used to locate rotating beam transmitters since the variation of the field strength at the receiver causes each curve drawn on the scope to indicate a false direction. This report gives two ways of overcoming the difficulty, by rotating the receiving antenna at a high speed and by the use of two receiving antennas. Graphs are included. (a-3, b-3, c-1, d-1, e-0, f-Modification)

2231. ANONYMOUS, "Radio - Direction Finding - Model DAK - Method of Phase Aligning and Measuring Balance: Problem S801R-C," NRL, Letter Report No. C-S67/69(301B)C-342-155; 20 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

2232. ANONYMOUS, "Radio - Direction Finding - Model DAB - Investigation of Errors in, Interim Report on NRL Problem S502T-C," NRL, Letter Report No. C-S67/69(342:AGL)C-342-19/45; 24 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2233. ALLISON, J. L., "Survey of Airborne Direction Finders," OSRD-5038, Service Project AN-22; 15 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2234. HARBURY, P. L., "Instruction Book for the M4502 Microwave Spinner and Associated Equipment for the M2300 D-F System and for the M4504 Microwave Spinner and Associated Equipment for the M3000 (AN/APA-17) D-F System," Radio Research Laboratory Report No. 411-1B-50. See also Department of Commerce PB14377; 24 February 1945. ABSTRACT: M2300 and M3000 are direction finding systems which enable an observer to determine the direction, sense, polarization, and frequency of a received signal. This handbook, prepared by Harvard University under contract with NDRC, gives information on the construction of the M4500 spinner and relay, R-f performance, operation, associated equipment, installation of the M4502, installation of the M4504 antenna for the M3000 (AN/APA-17 (A))D-F system, and maintenance. Diagrams, charts, and photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2235. ANONYMOUS, "Shipboard High Frequency Direction Finder," Federal Telecommunications Laboratories, Nutley, New Jersey; Proposal No. 305; 26 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2236. ANONYMOUS, "Radio - Direction Finding - Model XCZ Antenna Requirements - NRL Problem S989R-C," NRL; Letter No. C-S67/69 (342)C340-48/45; 27 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2237. ANONYMOUS, "SCR-269-F or G Automatic Direction Finder - Calibration of in PBY Aircraft," USN, Naval Air Station, Banana River, Report No. TED BAK 3144-13; 27 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

2238. MEYERS, G. B. AND MAC KAY, D., "Joint Direction Finding Procedure," (JANP 108). Joint Communications Board, Washington, D.C. See Department of Commerce PB13473; 27 February 1945. ABSTRACT: This pamphlet provides a standardized brief, clear method of passing requests and information pertaining to bearings, positions, and courses from a direction finding station or net to a ship or aircraft. (a-3, b-3, c-1, d-1, e-0, f-Procedure)

2239. ADCOCK, F., AND CLARKE, C., "An Improved Atmospherics Direction Finder," National Physical Laboratory (British) Report No. RRB/c.117, 28 February 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-264, f-0)

2240. ANONYMOUS, "Bibliography of Reports on Tropospheric Propagation," Columbia University, Report No. WPG-9; March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2241. ANONYMOUS, "Static Direction Finder AN/GRD-1," U.S. War Department Technical Manual No. 11-2696. See also Department of Commerce PB21892. March 1945. ABSTRACT: This weather direction finding equipment is an adaption of direction finding principles to the end that the direction from an observer to an electrical discharge can be measured accurately. If two such observations are made, the position of the discharge may then be determined by triangulation methods. The equipment is capable of detecting atmospheric discharges, or "sferics," which occur at distances up to several thousand miles from the observer. This equipment consists basically of a loop antenna, an amplifier, and a cathode ray tube. This manual, prepared by the War Research Laboratory, University of Florida, contains general information, operating instructions and maintenance hints for the equipment. Circuit diagrams and photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Description)

2242. ANONYMOUS, "VHF Homing Device," Electronic Industries, vol. 4, no. 3, pp. 104-105; March 1945. ABSTRACT: Army has developed a simple system to locate lost planes and help pilots navigate safely to their fields; homing device is application of rotary beam dipole antenna with one director element and one reflector element. (a-3, b-2, c-1, d-1, e-0, f-Description)

2243. GODDARD, N. E., AND HALLIDAY, D. F., "An Interim Report on a 2.1 Frequency Band Rotating Waveguide Joint," Admiralty Signal Establishment (British) Report No. M.700; March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2244. ANONYMOUS, "Germany - Communications - Radio - Prisoner of War Interrogation - Enemy Direction Finding Equipment," Signal Corps; Enemy Equipment Intelligence Service Report: No. 8-F3; 2 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment.

2245. ANONYMOUS, "Radio - Radar Intercept, First Production Model - Problem S150.8R-C - Installation and Test of USS SKATE (SS305) - Interim Report on," NRL, Letter Report No. C-S67/69(342: JRA)C-340-52/45; 6 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2246. PILKINGTON, E. J., "Effect of Buried Wires and Cables on Performance of Shore D/F Installations," U.S. Navy Yards, Boston; Report No. RMA-1; 6 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2247. BAREFORD, C. F., ET AL.,"Preliminary Trials of D/F Outfit RU4 in H.M.S. 'SALTBURN'," Admiralty Signal Establishment (British) Report No. M.708; 7 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2248. ANONYMOUS, "Radio - Radar Intercept System - Installation of Aboard USS BOARFISH(SS327) - Report on NRL Problem S180.1R-3," NRL, Letter Report No. C-S67/69(342:JRA); 10 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2249. CLARK, T. H., AND SCARBOROUGH, H. G., "Investigation of Site Characteristics Which Lead to Errors in Direction Finders," Federal Telecommunications Laboratories, Nutley, New Jersey. Report: TM 116; 15 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-94 and 391, f-0)

2250. ANONYMOUS, "Radio - Direction Finding - DAJ Equipment - Apparent Bearing Errors Presented by ABI," NRL, Letter Report No. C-S67/69(342G) C340-75/45; 20 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2251. ATHEY, S. W., "CXGA-M2600 Direction Finder," NRL Report No. RS 0014094; 20 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2252. ANONYMOUS, "Radio - Direction Finding - Model DBF Type Test of Production Model - NRL Problem S858T-C - Final Report on," 21 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2253. ANONYMOUS, "Standard Direction Finder Measurements," National Defense Research Committee, Division 13, Draft No. 2; 21 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 3015)

2254. ANONYMOUS, "Flight Test of Dual ADF Installation (Radio Compass SCR-269-F)," US Naval Air Station, Banana River: Report No. TED BAK 31144-12; 26 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2255. ANONYMOUS, "Radio - Direction Finding - Forwarding of Reports on: Encl: A. The Statistics of Bearing Errors. B. The Least Squares Method of Fix Determination. C.A. Graphical Method of Least Squares Analysis," U. S. Navy; 26 March 1945. (a-4, b-3, c-1, d-1, e-0, f-0)

2256. LINDENBLAD, N. E., "A Flush Surface Antenna of the Slot-Cavity Type Having Wide Band Characteristics," Radio Corporation of America, NDRC Report No. 895-32, Research Project No. RP-260; 26 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2257. ANONYMOUS, "Radio - Direction Finding - SCR269-F - Instructions for Modification of - NRL Problem S589R-C," NRL Letter No. C-S67/69(342:FTC); 27 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2258. ANONYMOUS, "Radio - Modernization of Existing Model DAJ High Frequency Equipment - Installation Changes Covering - Interim Report on," NRL Letter No. C-S67/69(342:RA-WM);27 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2259. ANONYMOUS, "Aircraft Direction Finder (1.5 - 22 Mc)," Federal Telecommunications Laboratories, Nutley, N.J., Technical Memo No. 113; 29 March 1945. ABSTRACT: This memo describes an aircraft direction finder for use in the frequency range 1.5-22 Mc. The direction finder employs a rotating loop collector an instantaneous bearing indicator of the cathode ray type and a frequency scanning adapter. (a-4, b-3, c-1, d-1, e-0, f-Description)

2260. ANONYMOUS,"Aircraft Direction Finder 27 - 100 Mc/s," Federal Telecommunications Laboratories, Nutley N.J., Proposal No. 329; 30 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2261. HEILIGTAG, T., "Basic Errors in Direction Finding," Paper published in 1923, Ajena thesis of 1922. Published in "Jahrbuch u Teleph," vol. 21, p 77; 1923; Office Commanding Signal Officer; 30 March 1945. See also NRL Report RS 37309. ABSTRACT: Not available. (a-4, b-1, c-4, d-4, e-0, f-0)

2262. STAWTON, C., "Model CXHT - Aircraft Direction Finder (28 - 100Mc.)," Federal Telecommunications Laboratories, Technical Memo No. 121; 30 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-96, f-0)

2263. ANONYMOUS, "Experimental Investigation of the Polarization Error of the U-Adcock Direction Finder with Various Forms of Earth Screen. (Third Interim Report),"National Physical Laboratory (British) Report No. WO/NPL.12; 31 March 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2264. ANONYMOUS, "Instruction Book for Model DAQ High Frequency Radio Direction Finder System," Federal Telephone and Radio Corporation, Newark, New Jersey. See Department of Commerce PB L88635; April 1945. ABSTRACT: This is a 185 page instruction book of a shipboard crossed loop D/F system. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2265. ANONYMOUS, "Modification to Provide for Testing Radio Compass Unit - R-5A/ARN-7 - BC-714-A," Army Air Force: TO-16-40BC-714-21. See also Department of Commerce PB43094; April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification)

2266. ANONYMOUS, "Radio Direction Finder and Beacon Service, Excerpts from H.O. 205 and Navy Training Courses: Radioman," U.S. Navy, Bureau of Personnel, Standards and Curriculum Division. See also Department of Commerce PB28978; April 1945. ABSTRACT: This pamphlet is a short discussion of the workings of radio bearings and radio beacons. Included is a glossary of terms used in radio direction finding. (a-3, b-3, c-1, d-1, e-0, f-Discussion)

2267. CLARK, H. K., ET AL., "Preliminary Instruction Book for M6200 (AS/222/APA-17) Antenna System," Radio Research Laboratory Report No. 411-IB-90. See also Department of Commerce PB 14365; April 1945. ABSTRACT: This antenna system includes the following: the M6200 antenna spinner, a direction-finding antenna to be used with the AN/APA-17 airborne direction-finding system for obtaining bi-directional bearings on horizontally-polarized signals in the nominal frequency range 60 to 280 mc; the M6202 remote tuning unit; the M6203 power supply. Photographs, drawings, schematics, and a parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2268. CLARK, H. K., ET AL., "Supplementary Preliminary Instruction Book for M-6200 (AS-222/APA-17) Antenna System," Radio Research Laboratory Report No. 411-IB-90-A. See also Department of Commerce PB14368; April 1945. ABSTRACT: Material included in this report is supplementary to that contained in Preliminary Instruction Book for M 6200 (AS-222/APA-17) antenna system (411-IB-90) which is designed for use with the ID-80 or (ID-80A)/APA-17 Amplifier Indicator and the AN/APR-1 or AN/APA-4 Receiver. Sections in this report are more in the nature of errata or addenda, so that subparagraphs numbered in the original report are missing from this report if they lacked errata or there is no supplementary material to present. Photographs of tuning unit and of indicator patterns of various types of received signals obtained with the M 6200 antenna spinner are appended. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2269. HAYWARD, R. W., "Development of an Experimental Directive Response Homing System," USN, NRL Report No. R-2511. See also Department of Commerce PB123354; April 1945. ABSTRACT: This report, unclassified 15 December 1953, contains 25 pages concerning radio homing devices, direction finders and related equipment. (a-3 and 4, b-3, c-1, d-1, e-0, f-RDF)

2270. KEMP, L. G., "A V.H.F. Visual Direction Finder (Rotating Aerial Type) Providing Immediate Indication of Sense," Royal Aircraft Establishment, Ministry of Aircraft Production(British) Technical Note: RAD 304 (JEIA: 10492); April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2271. ANONYMOUS, "Cross Modulation Investigation of Model DAJ Direction Finder Antenna Couplers," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 306; 3 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2272. ANONYMOUS, "D/F Receiver E.P.2a," Signal Corps, Holabird Signal Depot, Captured Enemy Equipment Report No. T-13. See also Department of Commerce PB1619; 6 April 1945. ABSTRACT: Description, illustrated with photographs and schematic diagrams, of characteristics and operation of a transportable D/F receiver for modulated or unmodulated transmitters with a frequency range of 75 kc to 3,333 kc (4,000 to 90 meters). The receiver is divided into the following subassemblies: Receiver frame with operating controls; case containing r-f and antenna coils; case containing mixer and oscillator coils; sharpness control capacitor; sense control potentiometer; D/F Sense switch. Receiver is composed of following stages: Antenna-section; radio frequency stage; high-frequency oscillator stage; mixer stage; intermediate-frequency stage; regenerative detector; audio-frequency stage. Instructions for maintenance and a list of parts are given. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2273. ANONYMOUS, "G. B. 'Hookah' (Wide Band Homer)," (British) See NRL Report No. RS0014973; 9 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2274. CHRISTENSEN, J. S., "C1900 VHF Homing Methods and Homing Equipment," Radio Research Laboratory Report No. 411-168; 10 April 1945. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-0)

2275. CLARK, T. H. AND DAUBARAS, E. "Ultra High Frequency Direction Finding Antenna Study (140 Mc - 600 Mc)," Federal Telecommunications Laboratories, Nutley, New Jersey: Technical Memorandum No. TM 122; 15 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-58, f-Study)

2276. ANONYMOUS, "Enemy Intelligence Summaries. Extract from Luftgaukommando XI Intelligence Summary," U.S. Army Air Force Headquarters 9th Air Force, Detachment B: Report No. 373.2; 18 April 1945. See also NRL Report RS0015105. ABSTRACT: Not available. (a-4, b-3, c-1, d-4, e-0, f-0)

2277. ANONYMOUS, "Final Report on Installation of Radio Compass SCR-269-F in Model PB2Y-5 (Converted PB2Y-3) Airplane - Study of," U.S. Naval Air Station, Patuxent: Report No. TED PTR-31677(4); 18 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

2278. GRANGER, J. V., "Broad-Band D.F. System," Radio Research Laboratory: Report No. ABL 1045-MR12; 23 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2279. ANONYMOUS, "Evacuated German Radio Monitoring Station at Enskirchan, Germany," Signal Corps, Enemy Equipment Intelligence Service Report No. 10-F17. See also Department of Commerce PB2281; 24 April 1945. ABSTRACT: This report describes and gives 4 photos of antenna equipment found at this station from which all associated radio equipment had been evacuated. From the construction of the antenna systems and the building located in the center of the single wire antenna system, it appears that this was a monitoring station. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2280. ANONYMOUS, "Radio - Direction Finding - Measurements - Comments on Preliminary Draft II, NDRC: Standard Radio Direction Finding Measurements," NRL, Letter Report No. C-67/69(301B); 26 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Measurement specifications)

2281. ANONYMOUS, "Operational Use of the AN/APA-24 D/F Antenna on B-29 Aircraft of the XX Bomber Command," Radio Research Laboratory Report No. 411-180; 28 April 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2282. ANONYMOUS, "Automatic Position Indicator for Aircraft," Electronics, vol. 18, p 180; May 1945. ABSTRACT NO. 1: A description of an aircraft panel instrument which gives continuous reading of longitude and latitude. The device is called the API (air position indicator). ABSTRACT NO. 2. One reason for the success of the bombing raids on Japan is the use of an automatic position indicator that gives continuous indications of latitude and longitude while in flight. These are shown on the instrument panel compass dial shown in the illustration. The unit was developed by engineers of Eclipse-Pioneer Division of Bendix Aviation Corporation in cooperation with the Army and the Navy air forces. The air position indicator, called API, combines the rotational speed of the true airspeed pump with the directional signal from the compass and produces continuous indication of the air plot in latitude and longitude. Proper application of the wind vector (the distance by which the air mass has moved over a specified period of time) to this air position yields ground position. The readings of latitude and longitude appear on the two drum-type counters, which are initially set to the proper latitude and longitude of the take-off point and can be reset anytime when passing over a check point in flight. The indicator, more specifically called the computer, also registers total air miles traveled and has a compass dial and pointer which must necessarily indicate heading with respect to true north. Operation of the instrument consists of checking the compass, energizing the API, and setting the counters to the proper latitude and longitude before take-off. During the take-off run, the true airspeed pump begins to operate at about seventy or eighty miles per hour, and the API then swings into operation. Magnetic north variation must be set in manually a degree at a time as the flight progresses, in order that the compass input reference is true north for resolution into geographic coordinates. Wind can be determined by the API itself by

noting the difference in air position as read on the API and ground position as determined by a check point, after flying for about forty minutes from a point where the API was set to ground position. The wind thus determined can be used for future flying. (a_1-6, a_2-5, b-1, c-1, d-1, e-0, f-Description)

2283. ANONYMOUS, "Calibrations of Shipboard Direction Finders (DAE, DAK, DAU)," U.S. Navy Bureau of Ships. See Department of Commerce PB17727; May 1945. ABSTRACT: This publication contains a general exposition of calibration procedures for medium frequency and high frequency shipboard direction finders and was written primarily for calibration crews and other personnel concerned with that type of work. The instructions are set forth under the following headings: I. preparations for calibration, II. calibrating facilities required (including personnel); III. adjustment of sense capacitor (DAQ/DAU); IV. high frequency direction finder procedure, V. calibration data; VI. forms (including an example of a correctly filled-in form); VII. typical calibration results; VIII. method used in averaging the values of a Re-entrant; and IX. medium frequency direction finder procedure and half-scale method of calibration. Drawings and diagrams included. (a-3, b-3, c-1, d-1, e-0, f-Calibration)

2284. ANONYMOUS, "Handbook of Maintenance Instructions for Radio Set SCR-634-A (Air Transportable D/F Station," Army Air Force, Technical Order No. AN16-40SCR634-2. See also Department of Commerce PB43695; May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2285. ANONYMOUS, "Instantaneous Direction Finding System 'Judy'," Radio Research Laboratory, Report No. ABL 1045-MR10; May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2286. ANONYMOUS, "Operating Instructions for D/F Outfit FV4," Admiralty Signal Establishment (British) Report No. SS136; May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Instructions)

2287. ANONYMOUS, "Radio Receiver and Loop Rotators BC-470-D and F: Repair Instructions," U.S. War Department Tech Manual No. 11-4014. See also Department of Commerce PB48171 (59 pp.); May 1945. ABSTRACT: Radio receiver and loop rotators BC-470-D and -F are components of a portable direction finder for ground use. They use a loop antenna, rod antenna, and nine tubes in a super-heterodyne circuit. AM and CW signals can be received, using either manual or automatic gain control. The frequency range is 200 to 18,000 kilocycles and is covered in eight continuous bands. Two intermediate frequencies are used, 147.5 kc for the 200 to 1,150 bands and 805 kc for the 1,150 to 18,000 kc bands. The loop rotator mechanism mounts on top of the receiver cabinet and supports the two antennas. An azimuth dial is located at the base for direction indication. Photographs, diagrams, drawings and a parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2288. BELL, R. E., "Non-Resonant Arrays," National Research Council of Canada. Radio Branch, Report No. PRA-128; Department of Commerce PB L87253; May 1945. ABSTRACT: The following data are considered: (1) Calculation of conductances, (2) Off-frequence performance, (3) input standing wave ratio, and (4) design of an array. Graphs are attached to this 12 page report. (a-4, b-3, c-1, d-7, e-0, f-Analysis)

2289. FOSTER, D., "Optimum Directivity Pattern for Search Antennas," Radio Research Laboratory Report No. 411-192. See also Department of Commerce PB 14232; May 1945. ABSTRACT: The possibilities and limitations of airborne search antennas are examined here. Design of the antenna will depend on whether a minimum acceptable probability of detection has been chosen since gain is dependent on the directivity of the antenna. Tactical and design consideration affecting the nature of antenna curves are discussed. The report is illustrated with sketches of antenna patterns. (a-3, b-3, c-1, d-1, e-0, f-Theory)

2290. TERMAN, F. E., AND PETTIT, J. M., "The Compensated-Loop Direction Finder," Proc. IRE, vol. 33, pp. 307-318; May 1945. ABSTRACT NO. 1: The use of a horizontal aerial attached to a loop for eliminating abnormal polarization errors is analyzed in detail. The dependence of the compensation on ground reflection coefficient is less serious than has generally been supposed, and it is shown that provided the ground coefficient remains constant a useful degree of compensation may be obtained over a wide range of working conditions. Experimental results from an elevated transmitter are given, and it is shown that bearing errors of the order of 45° for a plain loop may be reduced to 1-2° with the compensated system. ABSTRACT NO. 2: Polarization errors of a loop antenna are reduced by compensating for voltages introduced into the horizontal members. Compensation is accomplished with a small horizontal dipole and suitable coupling network. The conclusion is reached that the compensated loop is satisfactory as long as the compensation is adjusted for particular soil conditions. (a_1-2, a_2-6, b-1, c-1, d-1, e-665, f-Exhaustive experimental study and theoretical analysis, corrections to certain equations published Proc. IRE March 1947, see Abstract Nos. 1458 and 2797)

2291. ANONYMOUS, "Ground Direction Finding Receiver Fu. Peil E3, 190 to 600 Kc/s," Signal Corps, Enemy Equipment Intelligence Service, Report No. 10-F21. See also Department of Commerce PB2283; 1 May 1945. ABSTRACT: Technical characteristics and a photograph of this receiver are given. Antenna systems with which it may be used are listed. The receiver seems to be very well constructed, but with no outstanding unusual features. See PB2284 for report on one meter loop antenna for use with this receiver. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2292. EDWARDS, W. H., "German Fixed (One Meter Loop) Direction Finding System Fu. Peil A 40b (190 - 600 Kc/s)," Signal Corps, Enemy Equipment Intelligence Service Report No. 10-F23; 1 May 1945. See also Department of Commerce PB2284. ABSTRACT: The purpose and scope of this report is to provide a brief summary of technical characteristics and components, with identification illustrations, based upon a captured document. There was no information regarding this equipment previously available to this detachment. Technical characteristics are given in attached translation. See Report No. 10-F-21 for the Fu Peil E3 (Department of Commerce Report PB2283). Photographs of the loop antenna and the direction finding table are given. It is doubtful whether further study is necessary in view of the technical information available from captured documents. (a-4, b-3, c-1, d-1, e-845, f-Enemy equipment)

2293. MATHIAS, R. M., "A Simple and Rapid Method of Measuring Earth Constants," Simplified and condensed from British Report; Army Operational Research Group Report No. 260; 1 May 1945. ABSTRACT: A simple method of measuring ground conductivity and dielectric constant is described. No special equipment is required, all work being done with standard portable transmitters and receivers. Knowledge of the constants determined is of value in selecting sites for shore D/F or radio stations. The conductivity and the specific inductive capacity of the earth are of considerable importance in radio. They vary greatly over different types of earth and their values determine to considerable extent whether or not a particular site is satisfactory for a shore D/F installation, or a shore radio station. Over a given region, their values give a good indication as to whether ground wave transmission should be or should not be satisfactory, although they have little effect on sky wave transmission. In addition, it should be pointed out that conductivity and capacity of the earth seldom vary greatly within short distances, and, consequently, unless a wide choice in sites is available, knowledge of conductivity and capacity of the earth quite probably will be of little value. The method to be described corresponds quite closely to the "wave tilt" method advanced by Smith-Rose and Barfield. (a-1, b-3, c-1, d-5, e-393, f-Analysis)

2294. ANONYMOUS, "German Fixed Direction Finding System Funk-Peil-Anlage, Fu Peil A 40b (190 - 580 kc/s)," Signal Corps, Enemy Equipment Intelligence Service Report No. 10-F24. See also Department of Commerce PB2285; 2 May 1945. ABSTRACT: This is a description of equipment captured in Coblenz, Germany. This calibrator furnishes a crystal controlled fundamental frequency of 7000 kc plus harmonics, and has been designed for use with the German transceiver "Torn Fu. d2." In order to be used to calibrate this set the fifth harmonic (35000 kc) must be used. An appendix has a wiring diagram, form photographs, and operating instructions. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2295. DIGIACOMO, A., "Operation of a Standard Radio Set SCR-291 below 1.5 Mc," Signal Corps Engineering Laboratory, Evans, Report No. SPSGS-RDF-4-25 (Coles:D/F Group); 2 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2296. ANONYMOUS, "Frequency Scanning Direction Finder for Communications Band of 100 - 160 Mc/s," Federal Telephone and Radio Corporation, Newark, New Jersey, Proposal No. 330; 3 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2297. ANONYMOUS, "Technical Report on Ultra-High Frequency Direction Finding Receiver FUMB 4 Type RS 1/5 Called 'San os'," Signal Corps, Enemy Equipment Intelligence Service Report No. 9-11. See also Department of Commerce PB1588; 3 May 1945. ABSTRACT: The equipment described in this report is designed to receive amplitude, frequency, pulse modulated, and C.W. signals. The frequency range is such that the receiver can direction find on Airborne Radar as well as ground equipment such as radar, link, and very high frequency transceivers. The receiver is built in 5 separate components, which can be readily replaced in event of failure of one or more components. Technical characteristics and operating instructions are given in detail. The report includes photographs and diagrams of the equipment and its parts. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2298. DAUBARAS, E., "Design Principles for Types CFT 69083 (B) Loop (Replacement for DAQ-DAU Loops)," Federal Telecommunications Laboratories, Nutley, New Jersey: Technical Memo No. 129; 4 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2299. LIBBY, L. L., "CXGJ-4 Equipment (F.T.&R. #NLS-674)," Federal Telecommunications Laboratories, Nutley, New Jersey: Technical Memorandum No. 123; 4 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-374, f-VHF D/F)

2300. ANONYMOUS, "Radio - Direction Finding - Model X-DBA High Frequency Portable Equipment - Comments on NRL Problem S822.2T-C," NRL: Letter No. C-567/69(342:FTC)C342-45/45; 9 May 1945. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

2301. ANONYMOUS, "Report of Tests of Methods to Eliminate Model DAB Direction Finder Instrument Error on Frequency Bands 1 and 2," U.S. Navy Coast Guard; 9 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2302. ANONYMOUS, "Interchangeability of Radio Compass AN/ARN-7 with Radio Compass SCR-269 in Airplane JM-1 and R4D-3," U.S. Naval Air Station, Patuxent: Report No. TED PTR-31798.0; 11 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2303. ANONYMOUS, "Radio - Direction Finding - Development of Ultra-Portable Very High Frequency Direction Finder - Model DBN - Final Report on NRL Problem S331.2R-C," NRL: Letter No. C-567/69 (342:HGL:MH)C342-127; 12 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2304. ANONYMOUS, "Standard Direction Finder Measurements," National Defense Research Committee, Division 13, Draft No. III; 12 May 1945. See also Department of Commerce PB123718. ABSTRACT: Direction finders function on two generally different principles which may be divided into those employing amplitude comparison and those employing phase comparisons, or a combination of both principles. The investigation of the effectiveness of the different processes involved in reducing any of these comparative methods to practice is the subject of these measurements. Unclassified 17 December 1954. NDRC Dic. 13.1 (a-3, b-3, c-1, d-1, e-0, f-Measurement)

2305. ANONYMOUS, "Interim Development Report on Pony Project," Federal Telecommunications Laboratories, Nutley, N.J. Technical Memo No. 128; 15 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-377, f-Report)

2306. ANONYMOUS, "Report on German D/F Equipment," U.S. Army Forces in the European Theater. See Department of Commerce PB L60604; 15 May 1945. ABSTRACT: This is a report on the investigation of German direction finding equipment, the state of the German direction finding technique, the deployment of this equipment, and the differences existing between American and German sets. The information contained has been derived almost entirely from captured documents and covers loop sets, Adcock systems of the manually rotated type and crossed Adcock systems working into both manually and mechanically rotated goniometers. Various sets under each type are discussed, and a summary of commendable features is given. A bibliography of reference material on German D/F equipment is included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2307. ANONYMOUS, "Field Technicians' Reports," USN, Air Coordinating Group, Washington, D.C.; Report No. 600-1899; 18 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2308. ANONYMOUS, "Radio - Direction Finding - Model DAK-2 and DAK-3 - Balancer Systems for - Interim Report - NRL Problem S801R-C," NRL, Letter Report No. C-S67/69(342:NRG)C342-50/45; 18 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2309. ANONYMOUS, "Siting Instruments for Radio Direction Finders," Signal Corps, Holabird Signal Detachment; Captured Enemy Equipment: Translation No. T-16; 18 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2310. ANONYMOUS, "An Adaptation of the British Reradiation Frequency Meter," Federal Telephone and Radio Corporation, Technical Memo No. 117; 23 May 1945. ABSTRACT: The Reradiation Frequency Meter is designed for use as a test instrument for the installation, calibration, and maintenance of operation of medium and high-frequency direction finders, in particular, D/F on board ship. With the aid of this instrument the possible sources of error due to reradiation from resonant structures on the ship and therefore, the best location for the D/F can be determined before the installation of the D/F. The frequency range of the Reradiation Frequency Meter is 1.5 to 22 mc and a self-contained power supply is used. (a-4, b-3, c-1, d-1, e-95, f-Description)

2311. HORNBERG, K. O., "Production and Standardization of the Electromagnetic Waves within Shielded Rooms," NRL, Report No. R-2536; 24 May 1945. ABSTRACT: Mathematical analyses have been made of the field intensity existing at close proximity to both a terminated transmission line within a shielded room and an injection loop and are presented to permit the determination of such field intensities in terms of distance from the source of excitation and the exciting voltages. Experimental determinations have verified the accuracy and correlation of measurements made by both methods up to a frequency of 10 megacycles. Further investigations of the action of a terminated transmission line operated within a shielded room have indicated that the accuracy of field intensity below the line with respect to the frequency employed is a function of room size, line length and perfection of termination. For a room 22 × 14 × 12 feet in height, using a relatively small diameter transmission line, computed field intensities may be expected to be accurate within experimental limits up to a frequency of 15 megacycles but beyond this frequency, certain not completely determined conditions may introduce errors as high as 70% due to the existence of relatively sharp resonances. It is shown that pure resistive termination of a small diameter transmission line within a shielded room is inadequate to completely eliminate all standing waves at the higher frequencies. (a-1, b-3, c-1, d-1, e-141, f-Analysis)

2312. ANONYMOUS, Germany - Communications - Radio - German Intercept Receiver E. 351," Signal Corps, Enemy Equipment Intelligence Service, Report No. 9-13; 28 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Enemy equipment)

2313. ANONYMOUS, "Radio Compass SCR-269-F in PBM-5 Airplane Bu. No. 45405 - Ground and Flight Test of," USN, Naval Air Station, Patuxent: Report No. TED PTR-31664 (5); 30 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2314. ANONYMOUS, "Radio - Direction Finding - Radar Intercept System - Model DBU - Installation and Tests on USS SKATE(SS305) at Hunter's Point, California - NRL Problem S180.8R-C - Final Report on," NRL, Letter Report No. C-S67/69(342:JRA)C342-51/45; 30 May 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2315. ANONYMOUS, "D.F. Station Transportable, Adcock Type No. 2 in Trailer," Signals Research and Development Establishments, Provisional Pamphlet No. 604 A; June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2316. ANONYMOUS, "Instrument Flying: Advanced, Instructor's Syllabus," AAF Technical Manual TO-30-100B-2. See also Department of Commerce PB34522; June 1945. ABSTRACT: This instructor's syllabus contains ten lesson plans on radio range and seven on radio

direction finding. Drawings illustrate the report. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2317. KOHLER, H. W., "Effect of Parasitic Currents in Antennas of UHF Radio Ranges on Horizontal Field Pattern," U. S. Department of Commerce. Civil Aeronautics Administration: Technical Development Note No. 38. See also Department of Commerce No. PB L122256; June 1945. ABSTRACT: The term "parasitic currents" as used in this Note designates antenna currents excited by mutual coupling (through space) between two or more antennas. Specifically, the case of 3 loop antennas present in the UHF radio ranges is considered here. Of interest are the parasitic currents produced in the side antennas by current in the center antenna. The purpose of this Note is to furnish a qualitative picture of the effect of these parasitic currents on field strength, course sharpness, and clearance of the horizontal field pattern. No attempt has been made to analyze the complex nature of the coupling between loop antennas, especially since it is simple to measure relative magnitude and phase of the parasitic currents. As insufficient experimental data of the relationship between parasitic currents and their phase angle as a function of the tuning adjustments of the side antennas are available, a simple series circuit was assumed whose resistance is essentially the radiation resistance, and whose reactance is varied by antenna tuning. Caution must be exercised in making use of the parasitic currents in the side antennas of UHF radio ranges to modify the horizontal field pattern. The parasitic currents change the field strength on-course, magnitude and direction of maximum field strength and of minor lobes. The directions of zero or minimum field strength are not changed, and the symmetry of two associated beam patterns with respect to the course in not affected by parasitic currents (i.e., the course is not shifted). The field strength on-course can be either increased or decreased over that obtained in the absence of parasitic currents by detuning the side antennas. If the side antennas are at resonance or detuned to offer an inductive reactance, signal strength on-course is increased and course sharpness decreased by the parasitic currents. For certain capacitive tuning adjustments of the side antennas the field strength on-course is decreased and the course sharpness increased. The clearance can be either increased or decreased by parasitic currents, depending on side antenna tuning and on p_0, 0_0, k, 0. For specific cases the vector diagrams can be drawn and studied regarding the effect of parasitic currents on clearance and course sharpness. It is believed that, in general, the advantage of increased signal strength on-course can be increased in the order of 50% by using the parasitic currents in the side antennas. (a-1, b-3, c-1, d-1, e-825, f-Theory and analysis)

2318. KOHLER, H. W., "RMS Value of Horizontal Field Pattern of UHF Two-Course Radio Ranges," Civil Aeronautics Administration, Technical Development Note No. 37; June 1945. ABSTRACT NO. 1: Consideration of range system comprising 3-loop antennas located in horizontal plane; field strengths obtained under certain conditions are not directly comparable since different amounts of power are radiated; factors by which field strengths obtained have to be multiplied if radiated power in horizontal plane is to remain constant. ABSTRACT NO. 2: The problem treated is the determination of factors by which the field strengths of loop antennas, as obtained by a given method, have to be multiplied if the radiated power in the horizontal plane is to remain constant. Determination of the total radiated power would involve integration of Poyntings' vector over the hemisphere above ground, centered with the array. This difficult operation can be avoided by considering the field strength in the horizontal plane only. What may appear to be a rough method of arriving at the total radiated power is, from a practical point of view, quite satisfactory. Because of the counterpoise, relatively little high-angle radiation is obtained in the radio ranges considered, and for aircraft more than a few miles distant from the range station, the horizontal field strength is a fair approximation to the prevailing strength. The variation of field strength because of the interaction of direct and reflected waves does not need to be considered here. It is concluded that, when the power radiated in the horizontal plane is kept constant, the maximum strength and the field strength at 90° off-course remain constant and within 2 percent in the practical range of current-ratio values. On the contrary, the field strength on-course decreases appreciably as the ratio decreases. For proper comparison of field strengths on-course with values of the given variables, the calculations must be made for constant radiated power in the manner described. (a_1-3, a_2-2, b-3, c-1, d-1, e-0, f-Analysis)

2319. STUART, D. M., "Omnidirectional Range," Aero Digest, vol. 49, no. 6, pp. 76-77; June 1945. ABSTRACT: Progress report on its development presented; omnidirectional range has elements in common with all other types of radio ranges and direction finding systems, and represents refinement in practice rather than fundamental departure in principle. (a-3, b-2, c-1, d-1, e-0, f-Descriptive progress report)

2320. HALLORAN, A. W., "Document Digest for the Period 8 July 1942 to 21 March 1945," Radio Research Laboratory: Report No. RRL 411-64B; 1 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2321. ANONYMOUS, "Germany - Aerial Navigation - German and Ground DF Stations," U. S. Naval Air Attache, London: Report No. A7435-45; 5 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2322. ANONYMOUS, "Test Standards for Radio Equipment Operating within the Frequency Range 100 Kc - 30 Mc," Radio Technical Commission for Aeronautics; 6 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specification)

2323. ANONYMOUS, "Development of Multivibrator Switching and RF Amplifier Unit for AN/TRD-2," U. S. Signal Corps Engineering Laboratory, Evans: Report No. SPSGS-RDF-3-129; 8 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2324. STEPHENS, H., "Report on Field Test No. 3 Radio Set AN/CRD-2( )," U. S. Signal Corps, Engineering Laboratory, Evans: (Coles:D/F Group); 8 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2325. ANONYMOUS, "Technical Report on UKW PE e 1," Signal Corps, Enemy Equipment Intelligence Service Report No. 9-18. See also Department of Commerce PB1585; 11 June 1945. ABSTRACT: Description of direction finder receiver used to direction find Radio Sonde equipment. It is a 7 tube superheterodyne operating in the frequency spectrum of 83 to 100 mc/s. It is battery operated and easily portable, well constructed and compact. Sensitivity and selectivity are good. No comparison was made with U. S. Army equipment. Details of technical characteristics and operation of equipment are given. The report includes a photogram and diagram of equipment. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2326. RIFE, W. E., "Modeling the Direction Finding Loop Antenna: Application to a B-24 Aircraft," Ohio State University Research Foundation Report No. 100-3. See also Department of Commerce PB16435; 11 June 1945. ABSTRACT: This report describes the use of a modeling technique as applied to the testing of a D/F antenna for the frequency 15 to 30 mc. This technique had previously been used in measuring radiation patterns. In using this method a plane model is built to a scale 1/n and the test frequency is increased n times. In the work described in the report, the D/F antenna was larger than scale size but was considered satisfactory because it was still small in comparison with the wavelengths used. The model, in these tests, was mounted on a tower on which it could be oriented at any angle, placed in a modulated r-f beam transmitted from a horn radiator, the model antenna being used as a receiver, with results recorded on test instruments. Test results are given in radiation patterns and calibration curves. (a-3, b-3, c-1, d-1, e-0, f-Description)

2327. BUSIGNIES, H., ET AL., "Program of Investigation in Connection with the Deception of High Frequency Japanese Direction Finders," Federal Telecommunications Laboratories, Nutley, N. J., Report No. 1458-1; 12 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2328. LIBBY, L. L., "CXGJ-3 Equipment," Federal Telecommunications Laboratories, Nutley, N. J., Technical Memorandum No. 132; 12 June 1945. ABSTRACT: RDF Equipment, 20-100 Mcs; cathode ray tube bearing readout; report covers historical notes and technical characteristics. Experimental shore service equipment. (a-4, b-3, c-1, d-1, e-380, f-Description)

2329. ANONYMOUS, "German Technical Aid to Japan, a Survey," NRL Report No. RS0015861; 15 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2330. ANONYMOUS, "Radio Compass MN-26C in PV-2 Airplane Bu. No. 37037 - Ground and Flight Tests of," U. S. Naval Air Station, Patuxent: Report No. TED PTR-31770 (12); 15 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2331. ROSS, W., 'Note on Polarization Error of Short Wave Coupled-Adcock Direction Finder," National Physical Laboratory, (British) Report No. RRB/C, 19 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-229, f-0)

2332. DAVIS, H., "VHF Compass Investigation," Army Air Force, Wright Field, Dayton, Ohio; 26 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2333. ANONYMOUS, "Complete Communications and Navigational Antenna System on PV-2 - Development and Test of," U. S. Naval Air Station, Patuxent: Report No. TED PTR-31770(13); 27 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2334. ANONYMOUS, "C1908 Azimuth Homing System (Navy AN/APA 48)," Radio Research Laboratory Report No. 411-198; 28 June 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2335. LIBBY, L. L., "Special Aspects of Balanced, Shielded Loops," Federal Telephone and Radio Corporation: Technical Memorandum No. 135; 29 June 1945. ABSTRACT: This paper covered some of the features of high frequency loop behavior. The analysis is restricted to the case of the single turn, balanced, shielded loop wherein an inner conductor is positioned within a shielding tube of highly conductive nonferrous material. (a-4, b-3, c-1, d-1, e-159, f-Analysis)

2336. ANONYMOUS, "As-242/A Direction Finding Antenna System, Test Specifications," USN, BuAIR. See Department of Commerce PB LC 13623; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

2337. ANONYMOUS, "Bibliography of British War-Time Reports on High Frequency Measurements," British Commonwealth Scientific Office, Washington, D. C., Report No. 399; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Bibliography)

2338. ANONYMOUS, "D. F. Station, Mobile B/C No. 2A in Trailer 10 Cwt. 2-Wheeled. D/F Type 'A' BC2," Signals Research and Development Establishment, Ministry of Supply (British), Provisional Pamphlet No. 603A; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2339. ANONYMOUS, "Electronic Azimuth Indicators and Their Application to the SCR-291," Federal Telecommunications Laboratories, Nutley, N. J., Technical Memorandum No. 137; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2340. ANONYMOUS, "Loop Antenna Direction Finders," U. S. Signal Corps Engineering Laboratory, Monmouth: Signal Corps Board Report No. 5801; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2341. ANONYMOUS, "Preliminary Description of the Apparatus Used by a D/F Landing Team in a Two-Wheeled Trailer," (German: Telefunken) See: Department of Commerce PB L70574; ca July 1945. ABSTRACT: This document contains several pamphlets dealing with information concerning a two-wheeled D/F trailer used by a D/F team for landing aircraft. The pamphlets are instructional, technical, and operational. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (a-3, b-3, c-4, d-4, e-0, f-Description)

2342. ANONYMOUS, "Radio Frequency Quadrant Switching System," Federal Telecommunication Laboratories, Nutley, N. J., Technical Memorandum No. 138; ca July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-581, f-0)

2343. ANONYMOUS, "Report on the German G. S. R. Equipment 'ATHOS' Fitted in U-Boat 249," Admiralty Signal Establishment (British) Report M.726; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2344. LUKES, G. D., "Meteorological Analysis of the Propagation of Microwaves with an Application to Angle of Arrival Measurements," U. S. Signal Corps Engineering Laboratory, Evans, Technical Memorandum No. TMGE 10; July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

2345. ROWE, R. G., "Magnetostriction Compass," Electronics, vol. 18, pp. 123-125; July 1945. ABSTRACT NO. 1: A description of a magnetostriction compass and a short exposition of the magnetostriction phenomenon. ABSTRACT NO. 2: Rods of magnetostrictive material are subjected to an a-c magnetic field, and rotation in the earth's field changes the amplitude of vibration sufficiently to actuate a crystal pickup feeding an electronic amplifier and zero-center direction-indicating meter. While the gyro compass and radio range systems have aided immeasurably in the art of avigation, the magnetic compass still persists as a tremendously useful and important device. All magnetic compasses, however, suffer several definite impediments to accurate operation, one of which is known as the acceleration error. For example, with a magnetic compass mounted in aircraft, for a right turn from a north course the compass will indicate that the pilot is turning left, due to the fact that during the banked turn the plane of the pendulously mounted compass card tilts from horizontal and rotates erroneously owing to the now-present vertical component of the earth's field. On a left turn the reverse action will take place, rendering this type of compass inaccurate as a turn indicator. A further compass error is often introduced through the unfavorable magnetic location of the compass on the instrument panel of the aircraft, because of the proximity of the motor and the disturbing fields of wires carrying current to other instruments and controls. The magneto compass provided one of the first means for eliminating errors due to unfavorable magnetic location of the field-responsive device as well as substantially reducing errors due to acceleration. (a_1-6, a_2-1, b-2, c-1, d-1, e-0, f-Description)

2346. ANONYMOUS, "HF/DF Instructors Manual," U. S. Navy Coast Guard; 1 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2347. ANONYMOUS, "Ground Mark I Direction Finder, Model 2, Modification 2 Preliminary Report," Signal Corps, Enemy Equipment Intelligence Service Report. See Department of Commerce PB-43817; 2 July 1945. ABSTRACT: The direction finder described is a 10-tube high-frequency superheterodyne equipment manufactured by the Adachi Electric Company and used by the Japanese Army. The set uses a conventional superheterodyne circuit employing an untuned r-f stage connected to a goniometer, a t-r-f stage, pentagrid mixer, local oscillator, two i-f stages, a second detector, b.f. oscillator, and two audio amplifier stages. It operates from a 6-volt d-c source through a dynamotor. The frequency range of the set is from 2500 to 10,000 kilocycles. This report gives the general description of the set, including diagrams and photographs. (a-3, b-3, c-1, e-1, e-0, f-Enemy equipment)

2348. ANONYMOUS, "Radio - Direction Finding - Model DBN HF/DF Radio Direction Finder - Interim Report on," USN, NRL Letter Report No. C-S67/69 (340:MH) C342-118/45; 2 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2349. ANONYMOUS, "Radio - Direction Finding - Model XCY-NRL Problem S180.7R-C - Second Interim Report on," USN, NRL Letter Report No. C-S67/69 (342C) 4847; 2 July 1945. ABSTRACT: Not available. (a-4, c-3, c-1, d-1, e-0, f-Report)

2350. PARKER, G. J., "Reciever SN-4," Council for Scientific and Industrial Research (Australia), Report No. RP 256; 5 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-11, e-0, f-0)

2351. ANONYMOUS, "D/F Sets," Signal Corps Enemy Equipment Intelligence Service Report No. 10-23; See also Department of Commerce PB 2332; 6 July 1945. ABSTRACT: This report is a translation from captured documents. This information is not complete, as entire manuals were not translated, but instead only certain characteristics are given. The sets covered by this report are: 172N, FuPEc, A40d, A40e, A40f, A40g, A50b, A60a, A70a, A70b, A70f, A70e/f, A70h, A80a, A80c, A80d, A81a, A82a, Fu Peil E3. In addition to the technical descriptions, there are photographs and diagrams. (a-3, b-3, c-1 d-1, e-0, f-Enemy equipment)

2352. ANONYMOUS, "Wind Accuracy Expected with Combined Ranging and D.F. Equipment," Signal Corps, Engineering Laboratory,

Evans, Report No. SPSGS-RMB-4; 6 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2353. CHENEY, M. G., AND SNOW, J. R., "A Theoretical Analysis of the Possibilities of Direction Finding on Induction Fields from Power Lines," NRL Report No. R-2575. See also Department of Commerce PB-122785; 6 July 1945. ABSTRACT: A theoretical investigation has been made into the practicality of locating the position of a power plant or power line by using a loop type direction finder operating on the flux produced by either or both. This investigation has indicated that the external flux from an a-c generator is too weak to give appreciable distances but that an open wire power line might be located at relatively short distances under certain conditions. The scheme is not considered feasible inasmuch as both theoretical investigations by the Laboratory and practical tests by the Army at Camp Evans have indicated that an elevated two-wire line 300-feet long with conductors horizontally spaced six feet apart carrying 25 amperes at 60 cycles could only be located at a maximum distance of 750 yards. (a-1, b-3, c-1, d-1, e-152, f-Theory)

2354. ANONYMOUS, "German Short Range DF Loop and Preselector ul (Fu. NPV. ul)," Signal Corps, Enemy Equipment Intelligence Service Report No. 8-41. See also Department of Commerce PB2328; 7 July 1945. ABSTRACT: The Fu NPV. ul was manufactured in 1943 by an unknown manufacturer. It is a portable, short-range D/F adapter for use with the intercept receiver FuHeul. A wiring diagram and photographs are included in the report. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2355. ANONYMOUS, "Science Library List No. 6," Great Britain, Air Document Index; 10 July 1945. See Joint Electronics Intelligence Agency Report No. 10785. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2356. ANONYMOUS, "Radio-Direction Finding-Type 10 Quadrantal Error Correction Network for Models DAK-2, DAK-3 - Test of - NRL Problem S801R-C," USN, RNL Letter No. C-S67/69(342:FTC)C342-112/45; 12 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2357. ANONYMOUS, "Standard Direction Finder Measurements," National Defense Research Committee, Division 13, Provisional Draft; 12 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See modified reprint, dt'd 30 March 1949; Abstract No. 3015)

2358. ANONYMOUS, "Provisional Directions for Handling CHI (1) Mark I Radio Direction Finder," Army Air Force, AA Technical Laboratory, Translation No. 274; 15 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-Translation)

2359. ANONYMOUS, "Supplement No. 2 List of Naval Radio, Radar, and Sonar Equipment," USN, BuShips 242(A)-2; 15 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2360. ANONYMOUS, "Technical Report on Fu. P.E. c1 Direction Finder Receiver," Signal Corps, Enemy Equipment Intelligence Service Report No. 9-22. See also Department of Commerce PB 27761; 15 July 1945. ABSTRACT: This report presents general information, mechanical characteristics, technical data and operating instructions for this seven-tube superheterodyne receiver. Frequency range is from 1.5 mc to 25 mc in eight bands which overlap slightly. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2361. ANONYMOUS, "Instruction Book for Radar Direction Finder Equipment. Navy Type DBM-1," Submarine Signal Company, Boston, Mass. See Department of Commerce PB17493, 17 July 1945. ABSTRACT: The DBM-1 radar direction finder is essentially a radio and radar direction finding equipment, designed to receive radio and radar signals in the range 90-5000 megacycles. It presents upon a cathode ray tube screen an indication of the transmitter which is sending out the received signals. This handbook gives a general description of the equipment, discusses the theory of operation, the installation, adjustment and operation of the unit. The material on maintenance, is divided into three parts: operators maintenance, preventive maintenance, and corrective maintenance. Photographs, schematics, diagrams, and charts illustrate the handbook. (a-3, b-3, c-1, d-1, e-0, f-Description)

2362. ANONYMOUS, "Report on Tests on Direction Finder Set SCR-291A," National Physical Laboratory (British), Report No. S1.21a.13; 17 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Test)

2363. MCGUIGAN, ET AL., "Calibration Methods for DBM-1 Radio and Radar Direction Finder," Radio Research Laboratory Report No. 411-190. See also Department of Commerce PB14231; 18 July 1945. ABSTRACT: Problems peculiar to calibration over the frequency range covered by DBM-1 (90 to 5000 Mc) are considered. The report describes (1) methods of calibration, (2) signal sources and associated equipment, and (3) precalibration checks and procedures. Calibration of each shipboard installation of DBM-1 direction-finding system is desirable in order to check the overall alignment of the system and to determine the deviations produced by the ship's structure. (a-3, b-3, c-1, d-1, e-0, f-Calibration)

2364. ANONYMOUS, "Aircraft Direction Finder with Sector Operating Antennae 300 to 1000 Mc/s," Federal Telecommunications Laboratories, Nutley, N. J., Proposal No. 335; 19 July 1945. ABSTRACT: Not available. (a-4, c-3, c-1, d-1, e-0, f-Proposal)

2365. ANONYMOUS, "Direction Finding Equipment AN/APA-24 in PV-2 Airplane Bu. No. 37106 - Flight Test of," U. S. Naval Air Station, Patuxent, Report No. TED PTR-31831(3), 20 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2366. PRESSEY, B. G., AND HORNER, F., "Report on Certain Experiments and Theoretical Investigations on V.H.F. Direction Finding Systems for Use in the Field," National Physical Laboratory (British) Report No. S1-21a/16; 21 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2367. ANONYMOUS, "D-F - Model DAW High Frequency Direction Finder Trailer - Analysis of Principles of Operation - Final Report," U. S. Navy NRL Report Letter No. C-S67/69(301B)C340-123/45; 22 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

2368. ANONYMOUS, "Radio - Direction Finding - High Frequency Developmental Model X-DAX - Contract NXsr-45457, F. T. & R. Corp., Contractor - NRL Problem S-927T-C, Priority A-1 - Report of Type Test," U. S. Navy, NRL Report Letter No. C-567/69(342D) C342-124/45; 23 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2369. ANONYMOUS, "Remitter Attachment to Radio Set SCR-658," Signal Corps Engineering Laboratory, Evans, Report No. SPSGS-RDF-S-38; 23 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification)

2370. ANONYMOUS, "Preliminary Instruction Book Model DBF VHF Radio Direction Finder Equipment," Federal Telecommunications Laboratories, Nutley, N. J.; 24 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2371. ANONYMOUS, "D.F. Station Transportable Adcock No. 2 Provisional Working Instructions," Signals Research and Development Establishment (British) Report: Provisional Pamphlet No. 534A; 25 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Instructions)

2372. ANONYMOUS, "Radio - Direction Finding Model DBN High Frequency Direction Finding - Interim Report on NRL Problem S331. 4R-C," U.S. Navy, NRL:Letter No. C-567/69 (342:MH) C342-118/45; 26 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2373. ANONYMOUS, "Airborne Radar Direction-Finding Assembly AN/APA-17 in TBM-3 Airplane - Flight Test of," U.S. Naval Air Station, Patuxent: Report No. TED PTR-31738(3); 27 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2374. ANONYMOUS, "Report of Electronics Equipment on German Naval Units," U.S. Navy, Technical Mission in Europe, Report: Ser.

670; 28 July 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2375. ANONYMOUS, "Radio and Radar Equipment in the Luftwaffe-II Navigational Aids," Great Britain, Air Document Index (K), Report No. 357/1945; 30 July 1945. See also Joint Electronics Intelligence Agency Report No. 10784. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2376. ANONYMOUS, "Radio Set AN/CRD-3," U.S. War Department Technical Memorandum No. 11-513. See Department of Commerce PB23483; 31 July 1945. ABSTRACT: Radio set AN/CRD-3, described in this instruction manual, consists of a receiving and indicating system, crossed-U Adcock antennas, a sense antenna, and accessory equipment. It is designed for medium-frequency radio direction finding, transportable by air or vehicle, and may be operated from (commercial power or from) the power generator supplied with the radio set. It operates on a frequency range from 250 to 1500 kc. Tables, photographs and diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2377. ANONYMOUS, "Combination Instrument for Direction-Finding," Electronics, vol. 18, p. 214; August 1945. ABSTRACT NO. 1: A description of the "Marconator", a panel instrument for aircraft which shows relative bearings. Quadrantal error is compensated for by specially-shaped cones, and compensators for field-alignment error, due to misalignment of D/F loop, are included. Electronically-switched cardioid reception is used for sense indication. ABSTRACT NO. 2: An aircraft navigational aid recently designed by the Marconi Wireless Telegraph Co. incorporates in one unit the several instruments normally used to determine a radio bearing. True bearing may be read directly from a cursor, with automatic correction for sense. Electronically switched cardioid reception is used and an output meter indicates in which direction the aircraft should be turned in order to obtain an on-course setting. The tubes which perform the switching are in turn operated by means of a low-frequency oscillator. (a_1-6, a_2-5, b-2, c-1, d-1, e-0, f-Description)

2378. ANONYMOUS, "Features of New 28-Volt D/F Unit," Aero Digest, vol. 50, No. 4, p. 101; August 1945. ABSTRACT: Brief description of new 4-band automatic radio direction finder, which, because of space and weight savings, can be installed in smaller airplanes; developed by Fairchild Instrument Corporation. (a-3, b-2, c-1, d-1, e-0, f-Description)

2379. ANONYMOUS, "Handbook of Maintenance Instructions for Radio Compass AN/ARN-7," U.S. War & Navy Departments, Air Council of the United Kingdom. See Department of Commerce PB14792; August 1945. ABSTRACT: The radio compass AN/ARN-7 is designed primarily to be used as an aircraft-navigational instrument. Basically, the equipment is a radio receiver using a superheterodyne circuit and certain additional circuits necessary for radio compass operation. Two remote controls permit operation of the compass from either of two separate positions on the aircraft. The equipment has a frequency range of 100 to 1750 kc in four bands. The radio compass provides visual and aural indication of the direction of arrival of radio signals. It may also be used for the reception of modulated or CW radio signals using either a nondirectional or a loop antenna. This handbook gives a comprehensive description of the characteristics and use of the equipment including an 89-page section on its maintenance. The handbook is profusely illustrated with photographs, drawings, cutaway views, schematics, and wiring diagrams. It contains numerous tables and charts giving typical voltage and resistance readings of all parts of the equipment as well as other maintenance data and parts lists. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2380. ANONYMOUS, "Handbook of Operating Instructions for Radio Compass AN/ARN-11," Army Air Force, TO-AN-16. See Department of Commerce PB44645; August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2381. ANONYMOUS, "Instruction Book for Model DBB Ultra-High Frequency Direction Finder Equipment," USN, NAVShips 900, 769; August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2382. ANONYMOUS, "Present Direction Finder System of the 128th Signal R.I. Co.," U.S. Signal Corps; August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2383. COLLINS, T., "Evolution of Primary Equation of Direction Finding Mathematics," Aero Digest, vol. 50, p. 38; August 1945. ABSTRACT: It is pointed out that radio D/F avigation is restricted in application to certain kinds of problems, and in its development by eliminations of north-seeking compass; until mathematics of the art is rectified, no one can know which difficulties are inherent to directional reception and which can be overcome. (a-3, b-2, c-1, d-1, e-0, f-Discussion)

2384. GRIGG, R. W., AND YOUNG, W. R., "Study of Problems Arising from Closely Grouped Antennas," Bell Telephone Laboratories, Inc., OSRD Report No. 5503, OEMsr-1412, Project 13-103; August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

2385. PINE, C. C., "A New Type of Automatic Direction Finder," Proc IRE, vol. 33, pp. 522-528; August 1945. See also Aero Digest, vol. 50, p. 101; August 1945. ABSTRACT NO. 1: Output from each loop of a pair of crossed loops is amplified and rectified. Rectified dc signals are fed to crossed field poles of a meter to give a direct indication of bearing. A sense antenna is also used. Mechanical or electrical switching is used to eliminate necessity for more than one amplifier. Note: Busignies states that this system was covered in one of his patents 20 years ago. Cited in Engineering Index, p. 293, 1945. ABSTRACT NO. 2: A system is described which effectively converts the R/F currents developed in 2 low-impedance loops into direct currents of proportional amplitude and having the same relative polarity as the instantaneous values of the R/F currents. By using the 2 fixed loops in space quadrature, direct currents are obtained which can be applied to an indicating meter or crt to give a continuous visual indication of the angle, in the horizontal plane, at which an incident wave strikes the loop assembly. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Analysis)

2386. TOCZYLOWSKI, H. S., AND ROSINSKI, W., "Notes on the Limitations of V.H.F. D/F;" Admiralty Signal Establishment, (British) Report No. M. 732; August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2387. GILL, E. W. B., AND RILEY, J. H., "Direction-Finding with Ordinary Communications Wireless Sets," Army Operational Research Group, Ministry of Supply (also known as Operational Research Group, War Office & Ministry of Supply) Report No. 573; 19 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2388. KLINE, M., "Report of the Development of Radio Set AN/CRD-1," Signal Corps, Engineering Laboratory, Bradley B.; NRL Report No. ASF NRL 5314; 1 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2389. ANONYMOUS, "Operating Manual for High Frequency D/F Networks," USN, Coastguard; 3 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2390. ANONYMOUS, "Report on Experimental Work at Kellenhausen Experimental Station," Admiralty, Naval Intelligence Division (British), Translation No. 18111; 8 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-Report)

2391. ANONYMOUS, "Radio Calibration of Model DAJa and DAH DF, Seawall, Maine," USN, Naval Yards, Boston, Massachusetts; Report No. NR/567 (MER), Serial No. 49; 9 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Calibration)

2392. ANONYMOUS, "Report on German Direction Finding Equipment," U.S. Army Forces in the European Theater, Chief Signal Officer. See Department of Commerce PB53497; 10 August 1945. ABSTRACT: This report gives a description of particular points of interest of German D/F equipment. Data were obtained from German technical bulletins and operating handbooks. Also included are short summaries of data for each set, and general comments on German D/F installations and methods. Drawings and circuit diagrams are included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2393. ANONYMOUS, "Reports of Interrogation of Dr. T. Sturm Relative to Control of Guided Missiles," U.S. Navy, Technical Mission

in Europe: Report No. Ser. 0025; 11 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2394. WHITTKOPF, J. J., "Field Test of Crash Model C-1906 Homing Device," Radio Research Laboratory, Report No. 411-227; 11 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2395. SILVERSIDE, R. G., AND REDGMENT, P. G., "Adcock D/F Station (6 Aerial Type) Reichenau Strasse, Konstanz," Department of Commerce PB448; 13 August 1945. Combined Intelligence Subcommittee Evaluation Report No. 278. ABSTRACT: The apparatus had all been removed, only the feeder and connection being left. The masts were intact, the spacing between adjacent masts being about 5 yards. The interior of the mast base fitting was then examined and the circuit arrangements found to be as shown in sketch. This is of interest since both series and short damping are provided, and appear to be very heavy. The resistors were in the form of gray vitrious tubes, the values being marked on the resistors. (These were not checked by measurement.) A diagram of layout is shown. (a-1 and 4, b-3, c-1, d-5, e-845, f-Report)

2396. ANONYMOUS, "Interrogation of N.K.V. Personnel- (Wullenweber D/F," U.S. Army Alsos Mission; see Joint Electronics Intelligence Agency, Report No. 10945; 15 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2397. ANONYMOUS, "Recommendation from the Investigation of Model DP and DAK MF/DF," U.S. Naval Yards, Norfolk, Virginia; 15 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2398. ANONYMOUS, "Direction Finding Antenna Study for Aircraft Installation 1.5 - 22 Mc/s," Federal Telephone and Radio Corporation, Newark, New Jersey; Proposal No. 348; 18 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2399. ECKERSLEY, T. L., AND FARMER, F. T., "Short-Period Fluctuations in the Characteristics of Wireless Echoes from the Ionosphere," Proc. Roy. Soc. Series A, vol. 184, pp. 196-217; 21 August 1945. ABSTRACT: A new method for studying directional and polarization characteristics of wireless echoes is described. It uses an ordinary spaced frame direction-finding system, together with a twin-channel amplifier and cr tube, so that by observations of an ellipse on the screen the phases and amplitudes of the emfs in the aerial system may be determined. Either of the two characteristics mentioned may be studied by appropriate connections of the aerials. The equipment is applicable to pulse transmission. In polarization measurements a single ellipse is produced, corresponding to the emfs in 2 loops at right angles. In directional measurements, the aerials are switched at 25 c/s by relays so that 2 ellipses are produced, these representing the phase difference in the 2 pair of spaced frames. The figures are photographed on a moving film, the ellipses due to each pulse being recorded separately. Rapid changes in polarization and direction may thus be studied. The method is applied to various types of ionospheric echo and records illustrating their behavior are shown. A study is made of short-lived scatter echoes obtained on high power transmissions, whose characteristics change too rapidly to be followed by manual methods. The results of measurements are considered in relation to the general problem of ionospheric irregularities. (a-3, b-1, c-1, d-5, e-0, f-Description)

2400. SMYTH, C. P., AND VOGT, K. P., "High Frequency Research of the Evacuated Laboratory of the German Reichspost at Landshut (Interview with Dr. Karl P. Vogt, Director)," U.S. Army, Alsos Mission: Report No. CPS/269; 21 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2401. ANONYMOUS, "Radio - Direction Finding - Model DBM-1 Contract NXsr-80024, Submarine Signal Company - Type Test of Production Model - NRL Problem S1063T-C - Interim Report on," U.S. Navy, NRL:Letter No. C-S67/69(342g)C342-116/45; 22August 1945 ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2402. ANONYMOUS, "Proposed Specifications for Portable Radio Direction Finders Frequency Ranges 1.5 to 20 Mc," U.S. Navy, NRL: Letter Report No. RA 13A 268A; 23 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

2403. GODLEY, P. F., "Test of Loop Transmission Lines," U.S. Naval Air Station, Banana River:Report No. BAK-3144-20; 24 August 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2404. ANONYMOUS, "Automatic Bearing Indicator Circuits," Magnetron Magazine, vol. 1, No. 3, pp. 26-27; September 1945. See also NRL Report No. RS35260. ABSTRACT: Not available. (a-4, b-2, c-1 d-1, e-0, f-0)

2405. ANONYMOUS, "D.F. Station, Mobile B.C. No. 2A," Signals Research and Development Establishment (British) Provisional Pamphlet No. 543A; September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2406. ANONYMOUS, "Decca Navigator," Flight, vol. 48, no. 1916, pp. 285-286; September 1945. See also Shipbldg & Shipg Rec., vol. 66, no. 11, pp. 251-253; 13 September 1945. ABSTRACT: Details of principles, operation and advantages of new radio system for instantaneous and accurate position indication; Decca Navigator has certain similarity in operation to "Gee," but is purely radio system; it is stated that without any of complication and special operation required by any radar system, Navigator is actually about five times more accurate, is much easier to use, and can be operated very much more quickly. (a-3, b-2, c-1, d-1, e-0, f-0)

2407. ANONYMOUS, "Handbook of Maintenance Instructions for Oscillator Test Equipment, RC-93-A," Army Air Force, Technical Order: TO-AN-16-40RC-93-2. See also Department of Commerce PB-43601; September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2408. ANONYMOUS, "Notes on the Preparation of Skip Distance and MUF Charts for Use by Direction Finder Stations (for Distances out to 4000 Km)," U.S. Bureau of Standards IRPL Report No. 21. See also Department of Commerce PB L62774;September 1945. ABSTRACT: This report describes (a) a method of determining skip-distance and muf in the region around a D/F station for average ionospheric conditions, and (b) a means of adjusting these values for the ionospheric conditions of a particular day. The method takes account of propagation by the regular layers only. During those months and in those parts of the world where sporadic E (Es) is prevalent it may considerably decrease the skip-distance at frequent irregular intervals. The procedure is described in detail. Appendix A describes the construction of great circles on the IRPL modified cylindrical projection, for paths emanating from a single point. Tables, scales, curves, and graphs are included. (a-3, b-3, c-1, d-1, e-0, f-Propagation)

2409. ANONYMOUS, "Radio Receivers BC-973-A and B: Repair Instructions," U.S. War Department, Technical Manual No. 11-4028. See also Department of Commerce PB48174; September 1945. ABSTRACT: Radio receiver BC-973 consists of a portable direction finding radio designed for amplitude-modulated or continuous-wave signals. It is designed to determine the direction or azimuth of radio transmitters operating within the frequency band from 1 to 3 megacycles. It is essentially two receivers in one, each connected to a loop antenna, mounted at an angle of 90 degrees t each other. The loops feed two identical superheterodyne circuits, a sense circuit and a direction indicator, which compares the outputs of the two circuits. The receiver is powered by a storage battery and a dynamotor power supply. Photographs, drawings, diagrams and a parts list are included. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2410. APPLETON, E. V., "The Scientific Principles of Radiolocation," Alta Frequenza, vol. 14, pp. 230-232; September-December 1945. See also JIEE, Part I, vol. 92, pp. 340-353; September 1945. ABSTRACT: The measurement of distance by radio-waves, using frequency modulation, and pulse or amplitude modulation is described, and practical applications to the radiolocation of aircraft and ships are given. The radiolocation of natural objects (e.g., meteorites during the day) is also described. It is not inherently impossible to radiolocate the moon. The scattering of radio-waves by objects of different shapes, the influence of earth reflexions in ultra-short-wave transmission, and the bending of rays in a stratified atmosphere are discussed in appendices. (a-3, b-1, c-1, d-5, e-0, f-Summary)

2411. FRYER, H. C., "A Statistical Method for Radio Direction (D/F) Evaluation," Columbia University Report No. AMG-C467; September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2412. PRICE, E. H., "Maintaining Radio Direction Finder," Naut. Gaz., vol. 136, pp. 54-57; September 1945. ABSTRACT: Description of the Mackay radio direction finder, which is of binnacle cabinet type, designed for mounting in chart room or pilot house. There are suggestions for proper maintenance of apparatus. (a-3, b-2, c-1, d-1, e-0, f-Description)

2413. KRAUS, J. D., ET AL., "The M6120 Broad-Band Antenna Spinner for the M4100 (DBM) Direction Finding System," Radio Research Laboratory Report No. 411-233. See also Department of Commerce PB14254; 8 September 1945. ABSTRACT: This report describes the performance characteristics of the M6120 broad-band antenna spinner which was developed for use with the M4100 radio and radar direction finding system. Illustrations of antenna patterns for both vertical and horizontal polarization are presented over the frequency range from 80 to 3000 mc. (a-3, b-3, c-1, d-1, e-0, f-Description)

2414. FIELD, J. N., "The General Reciprocity Theorem in the Theory of Receiving and Transmitting Antennae," Compt. Rend. Acad. Sci. U.R.S.S., vol. 48, pp. 476-478; 10 September 1945. ABSTRACT: The reciprocity theorem for two arbitrary antennas in the case of harmonic oscillations of one and the same frequency f is written . . . $I^{(1)}E_1 = I^{(2)}E_2$, where $I^{(1)}$ and $I^{(2)}$ are the currents passing through the terminals of the first and second antennae when operating as receiving aerials and E_1 and E_2 are the total electromotive forces of the generators connected to the terminals of the antennas when the latter are operating as transmitting aerials . . . (This theorem) holds, however, only under the condition that the internal (complex) resistances of the generators z_1 and z_2 corresponding to the resistances of the receivers $Z^{(1)}$ and $Z^{(2)}$ . . . are equal." The more general case, when the conditions is not fulfilled, is considered in this paper. (a-1, b-1, c-1, d-3, e-0, f-Theory)

2415. ANONYMOUS, "Method of Installation and Pattern Measurement of C1950 Series Homing Antennas (AN/APA-48) in Various Type Aircraft," Radio Research Laboratory, Report No. 411-213; 11 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2416. STAVIS, G., "M6700 Shipborne D/F Antenna," Radio Research Laboratory, Report No. 411-243; 11 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2417. LINDSEY, G. R., "Theory of Accuracy Tests by Double Theodolite Fixes," British Commonwealth Scientific Office, Washington, D. C., Report No. 91-C2-51; 12 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2418. SCHLICKE, I., "Electronics Research in the German Navy-Prevention of D/F'ing of Radio Transmissions," U.S. Naval Intelligence; 15 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-237, f-0)

2419. ANONYMOUS, "Instructions for Modifying Models DAU and DAJa Direction Finding Equipments to Include Automatic Gain Control," U.S. Navy, NRL:Letter Report No. RA69A226A; 19 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2420. JONES, L. F., "Final Statement Regarding Dissolution of NDRC Div. 13," National Defense Research Committee, Division No. 13; 21 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2421. ANONYMOUS, "Static Direction Finder AN/GRD-1A," U.S. Army War Department, Technical Manual No. TM-11-2693; September 1945. See also Department of Commerce PB L78620; ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2422. ANONYMOUS, "The Addition of CRDF to Provide Recognition: Mildenhall," Telecommunications Research Establishment, Ministry of Supply (British) Report No. T. 1940; September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2423. BUSIGNIES, H., CLARK, T. H., AND SCARBOROUGH, H. B., "NLS-694 Aircraft Radio Direction Finding Equipment," Federal Telecommunications Laboratories, Nutley, N.J., Technical Memorandum No. TM. 142; 29 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2424. CLARK, T. H., AND MARCHAND, N., "Investigation of Compensation in Direction Finders," (Final Report on Contract OEMsr-1490 Miscellaneous Current Direction Finding Problems.) F. T. R. Report, CSRD Report 6657. See also Department of Commerce PB-L87755; 30 September 1945. ABSTRACT: Mr. J. N. Pettit's report to the NDRC, "A Report on Investigation of Compensation in Direction Finders," contains, in expanded form, the same material as the article on compensated loop direction finders by Mr. Pettit and Professor A.W. Terman, in the May, 1945 Proceedings of the Institute of Radio Engineers. His report concludes: "Promising results are obtained from the proposed system of compensating for the loop voltage induced by the horizontal wave component by means of a voltage obtained from an auxiliary horizontal antenna mounted on a loop structure and rotating with it." His report also states that theoretical analysis shows that the limits of the effectiveness of the system depend on how nearly constant the relative phase and magnitude ratio of the loop and horizontal antenna voltages remain, as the external operating conditions vary from the conditions under which the initial compensating adjustments were made. The compensated loop was studied by FTR Laboratories, whose final report states that results were rather discouraging. The important item to be determined is whether the findings of Mr. Pettit's report were corroborated by those of FTR Laboratories, or whether there is some basic difference between them. It is concluded that, basically, there is no theoretical disagreement. However, it is shown that the coupling networks should, if possible, include means for resolving the differences in the internal impedances of the loop and dipole antennas. (a-1, b-3, c-1, d-1, e-57, f-Report)

2425. CLARK, T. H., AND MARCHAND, N., "Miscellaneous Current Direction Finding Problems," Federal Telephone and Radio Corporation, OSRD Report No. 6657, OEMsr-1490, Project 13-122; 30 September 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Summary)

2426. ANONYMOUS, "'Kunax-Z' Storage Method of Direction Finding," Office of Commanding Signal Officer, ETO, North Atlantic: Intelligence Report No. REC-1; October 1945. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

2427. ANONYMOUS, "Triangulation Tests at the New York, Pittsburgh, and Washington Direction Finding Stations," U. S. CAA, Technical Development and Evaluation Center, Indianapolis, Indiana. See Department of Commerce PB122257; October 1945. ABSTRACT: Description of triangulation tests conducted during period of December 3-12, 1942, on three Civil Aeronautics Administration direction finders; tests were conducted primarily to determine limitations and accuracy of equipment when used to establish position of airplane by triangulation methods. (a-3, b-3, c-1, d-1, e-0, f-Description)

2428. DIEHL, E. J., "Generator - Power Radio Proximity Fuse for Mortars; Loop Transverse-Antenna Type," Zenith Radio Corporation, Chicago, Ill.: Report No. A-390: October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2429. HANSEL, C. W., "Antenna," Radio; vol. 29, no. 10, p. 39; October 1945. ABSTRACT: Combination of two V-antennae to obtain a directive system with broadband characteristics. (a-5, b-8, c-1, d-1, e-0, f-0, g-Summary of U.S. Patent #2,379,706)

2430. HARLEY, L. S., "New Method of Radio Navigation," Electronic Engineering, vol. 17, No. 212, pp. 713-716; October 1945. ABSTRACT: Name "G" or "Gee," as it is more often spelt, is abbreviation for "Grid," relating to grid map references in use by RAF navigators; in order to overcome difficulties of navigation in all weathers on bombing flights over Germany, it became necessary to devise method to give accurate location on map at all times during flight, utilizing for purpose, known speed of propagation of radio waves; corresponding system in United States is called "Loran." (a-3, b-2, c-1, d-5, e-0, f-Description of LORAN)

2431. HOLBROOK, J., "High-Frequency Error Curves for Adcock Radio Direction Finder Arrays," Proc. IRE, vol. 33, p. 723; October

1945. ABSTRACT NO. 1: This correspondence indicates that Adcock arrays may be used at frequencies above that which makes the element spacing one-half wavelength if suitable error curves are calculated and used. ABSTRACT NO. 2: When determining errors in a radio direction-finder station located in a new, untested location, it is helpful to know, for a given signal and observed bearing, just how much error is due to actual "site trouble" and how much is due to antenna-array error. If the antenna error is known, the exact magnitude of remaining site errors may then be considered and conclusions drawn accordingly. The following method of measuring errors in Adcock antenna arrays may prove useful to some field engineers engaged in high-frequency direction-finding work. It is well known that the average high-frequency crossed Adcock array, using a goniometer, is subject to a varying number of degrees error in certain directions, when taking bearings on different frequencies, the errors being due primarily to the physical spacing between the antennas. Many engineers not too familiar with the problem figure i ıitively that the ratio of North-South antenna pair pickup to Eas West pickup is such that, if plotted out vectorially, would enable tnem to measure the bearing of the signal by noting the angle of the vector resultant. This view is useful to present the approximate operation and theory of the system, but to find the exact bearing that a given antenna array will produce for a signal from a given direction, we must figure the exact ratio of North-South pickup to East-West pickup and then find the resultant angle exactly. It will then be noted that this angle may be several degrees different than the true angle or bearing of the signal. Some engineers have been known to believe that the crossed-Adcock system using a goniometer is unsuitable for use with frequencies so high as to make the greatest antenna spacing more than a half wave-length, but by using the method we will now discuss, it will be seen that a correction curve may be drawn which will correct exactly all errors due to the spacing of the array; thus an array spaced a half-wave-length at perhaps 15 megacycles may be used effectively with good results up to about 20 megacycles. Prior to drawing the curve, we must choose the frequency, have the antenna spacing in feet (S), and then, using the following data, find instrument bearings for the true bearings from 0 to 45 degrees, in steps of not more than 5 degrees. The two columns of "true" and "observed" bearings will then be all that is necessary for drawing the curve. It is only necessary to plot the error curve up to 45 degrees, as the same values and curve, inverted, may be used from 45 to 90 degrees, and the 0- to 90-degree curve is the same as the 90- to 180-, 180- to 270-, and the 270- to 360-degree curve. The four antennas, or towers making up the array will be assumed to be placed on true North, East, South, and West and will be abbreviated N, E, S, and W. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Analysis)

2432. MORRIS, M. S., "The Value of Accuracy in Shipborne H/F D/F," Admiralty Signal Establishment (British) Report No. M. 748; October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-186, f-0)

2433. NIESSEN, K. F., "Ratio between Horizontal and Vertical Electrical Field of Vertical Antenna of Infinitesimal Length Situated above Plane Earth," Philips Research Reports, vol. 1, No. 1, pp. 51-62; October 1945. ABSTRACT: Results of author's calculation; it is shown that this question is of interest in connection with the landing of aircraft by means of radio beacons. (a-3, b-1, c-1, d-5, e-0, f-Theory)

2434. WHITBY, O. W., "AN/APA-42-TI Direction-Finding-Antenna Trainer," Radio Research Laboratory Report No. 411-282. See also Department of Commerce PB L61394; October 1945. ABSTRACT: This report gives a description of the components of the AN/APA-42-TI D/F-antenna trainer, and outlines the principles of its operation. Instructions for putting it in working condition and aligning it before use and suggestions for training flights are included. The full cabling chart of the trainer, circuit diagrams of the major units, photographs of all pieces of apparatus, a block diagram, and a parts list are also included. (a-3, b 3, c-1, d-1, e-0, f-Description)

2435. ANONYMOUS, "Instruction Book for M6700 X-Band D/F Antenna and Associated Components," Radio Research Laboratory: Report No. 411-1B43; 8 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2436. JANSSEN, H., "Receiving and Bearing Schemes with Directional Characteristics," Signal Corps Engineering Laboratory, Evans; Report No SPSGS-RDF-4-50; 10 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2437. ANONYMOUS, "Automatic Direction Finder for Bearing Indication on Radar Pulses," U S. Navy; 16 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2438. ANONYMOUS, "Instructions for Alignment and Installation of DAJ Antenna Coupling Transformer for Bands 2 and 3," U S. Navy, NRL:Letter Report No. RA 30A 220A; 16 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2439. ANONYMOUS, "Radio - Direction Finding - Model CXFF - NRL Problem S926T-C Interim Report on Test," U.S. Navy NRL: Letter No. C-S67/69(3016) C342-162/45; 18 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2440. BUTLER, H. J., "Tests of German Radio Direction Finder," U.S. Signal Corps Engineering Laboratories, Evans, Belmer, N.J., 19 October 1945. See Department of Commerce PB2000. ABSTRACT: Pursuant to letter from Office of the Chief Signal Officer (SPSRL-2K), dated 8 June 1945, to Commanding Officer, SCEL, a series of tests were conducted at the Evans Signal Laboratory to determine the performance characteristics of Radio Direction Finder EP-2a. The results of these tests supplement the comparative data contained in the Signal Corps Board Case No. 580, "Loop Antenna Direction Finders." The nomenclature EP-2a refers to the receiver unit only and not to the complete direction finder as commonly applied. In its simplest form, The direction finder consists of the EP-2a Receiver, a rotatable azimuth scale assembly, Loop Assembly PR-4, a vertical sense antenna, and Power Supply Unit NA. 1. It is believed that nomenclature for this assembly is Poilanlagen 101N. Loop assembly PR-4 consists of two loops, each approximately 1 meter square, crossed at right angles and insulated from each other. The loops are of low impedance, constructed of 1/2-inch (approximately) red brass tubing, hinged at the corners to permit folding for transportation. The loops are mounted on the rotatable azimuth scale which is in turn secured to the top of the receiver. Electrical connection to the receiver input is made through the DF/Sense Switch. With the switch in the normal (direction finding) position, only one loop is connected to the receiver input and provides simple aural-null determination of the line of bearing direction by virtue of its familiar figure-8 response pattern. In the first sense position of the switch, the second loop and the sense antenna are connected to the receiver input in place of the original loop and combine to provide a cardioid response pattern, the axis of which is in line with the null of the original loop. The second sense position reverses the cardioid pattern by reversing the loop connections. As a result, rapid determination of the sense of the bearing can be accomplished after the line of bearing has been obtained. The Receiver EP-2a is a six-tube superheterodyne of conventional design except for the second detector which is regenerative. (a-4, b-3, c-1, d-1, e-845, f-Test)

2441. ANONYMOUS, "Azimuth Indicating System." Office of Commanding Signal Officer:Report No. 19:A-1308; 23 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2442. ANONYMOUS, "Radio Direction Finding - Model XCY - NRL Problem S180. 7R-S - Final Report on," U.S. Navy NRL:Letter No. S-567/69 (342F) 5480; 29 October 1845. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2443. OHIO STATE UNIVERSITY RESEARCH FOUNDATION, "Final Report on Contract NDCrc-100," Report No. 100-4; 30 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2444. ALLISON, J. L., AND LEWIS, J. H., "Electrical Direction Finder Evaluator and 'Statistical Method for Radio Direction Finding Evaluation'," J.A. Maurer, Incorporated, Long Island, N.Y., Project 13-121. See Department of Commerce PB 19777; 31 October 1945. ABSTRACT: This is a description, operating manual, and final report on the development of a device which, from the bearings to a radio transmitter measured by any number of fixed radio direction finders, determines by electromechanical means the following values: (a) the most probable location of the transmitter; and (b) the boundary of the smallest region in which, to any proassigned locality, the transmitter can be presumed to be located. The device was designed by personnel of Division 13, NDRC, and of the Applied Mathematics Group, Columbia University. The development was by J. A. Maurer, Inc. Appendices contain a statistical method for D/F evaluation, sampling studies relative to operation of the evaluator, and considerations for its further development. Photographs, diagrams, and graphs are included. (a-3, b-3, c-1, d-1, e-268, f-Description)

2445. KITCHEN, F. A., "Interrogation of Major Kreutstrager, G. A. F.," Admiralty Signal Establishment (British); 31 October 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2446. ANONYMOUS, "The Loran System," Electronics, vol. 18, No. 11, 12, pp. 94-99 and 110-115; November, December 1945. ABSTRACT: Loran (Long Range Navigation) is system of pulsed transmissions on 1700-2000 kc which permits ship or aircraft to determine position with accuracy not less than 15 mi at distance of 1500 mi from shore; history of development and operating principles given; circuit details; shore-station equipment, including transmitting and radiating system, timer and synchroniser described. (a-3, b-2, c-1, d-1, e-0, f-Description)

2447. ANONYMOUS, "New Aid to Navigation," Electrician, vol. 135, pp. 592-593; November 1945. ABSTRACT: A new position-finding system, which is known as the Decca Navigation System, is briefly described. (a-6, b-2, c-1, d-5, e-0, f-Description)

2448. ANONYMOUS, "Preliminary Specification, D/F Outfit FM7," Admiralty Signal Establishment (British) Report No. B128/41; November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Specifications)

2449. ANONYMOUS, "Radio Receiver BC-1005-A: Repair Instructions," U.S. War Department Technical Manual No. 11-4047. See also Department of Commerce PB48184; November 1945. ABSTRACT: Radio receiver BC-1005-A is a 15-tube high-frequency superheterodyne receiver designed to receive c-w and a-m signals. It is one of the components of radio set SCR-555-A, a semiportable ground radio direction finder station used to determine the direction of distant radio transmitters. The frequency of the receiver is continuously variable in two bands, 18 to 34 and 34 to 65 megacycles. The receiver is used in conjunction with a rotatable Adcock, or directional antenna and a fixed, vertical, nondirectional antenna. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2450. BARKOFSKY, E. C., "M6600 X-Band Antenna and Drive Assembly for Use with M3000 (AN/APA-17) Airborne Direction Finder," Radio Research Laboratory Report No. 411-287. See also Department of Commerce PB L61387; November 1945. ABSTRACT: This report describes the M6600 X-band antenna and drive assembly, which was designed for use with the M3000 air-borne direction finder (AN/APA-17) operating in the frequency range 5000 to 12,000 megacycles. There is a brief discussion of the factors influencing the general design and construction. The theory of operation of the horn as a radiator and receiver of circularly polarized signals and the steps involved in its design for a specific frequency range are described. The performance of the resultant antenna assembly actually constructed is indicated on curves. The use of the M6600 antenna with the M3000 direction finder is discussed. Photographs, drawings, curves and radiation patterns are included. (a-3, b-3, c-1, d-1, e-0, f-Description)

2451. KENDALL, E. M., "Receiver Loop Antenna Design Factors," Communications, vol. 25, no. 11, pp. 62-64; November 1945. ABSTRACT NO. 1: A high Q is necessary, and this must be obtained with the loop in its normal position in the receiver. Test results on solenoid, basket weave, and embossed types of loops are given. ABSTRACT NO. 2: Three types of loop antennas analyzed; solenoid, basket weave, and embossed type; influence of base dimensions, conductor and base materials, mountings and loop designs on antenna efficiency. (a_1-4, a_2-3, b-2, c-1, d-1, e-0, f-Description)

2452. McKINLEY, D. W. R., "A Note on the Detection of Undersea Craft by Means of Low Frequency Radiation from Aircraft," Canadian Journal of Research, A 23:77-85; November 1945. ABSTRACT: A semiquantitative examination is made of the chief factors affecting both the transmission of low frequency radiation from aircraft to a submarine and the return of this energy to the aircraft by scattering. A general expression is derived for the returning field strength, and graphs are shown for a representative set of conditions. It is indicated that, even under the most favorable conditions, the amount of energy returned is below the level of detectability, if the submarine is submerged more than 10 feet. However, it is also pointed out that communication between a shore station and an undersea craft should be feasible under certain conditions. (a-4, b-1, c-1, d-7, e-178, f-Analysis)

2453. STRUSZYNSKI, W., MUGRIDGE, A. H., AND INGREY, B., "Interim Report on Conversion of Submarine M/F D/F Frame-Coil S-21 for H/F D/F Operation," Admiralty Signal Establishment (British) Report No. M.755; November 1945. ABSTRACT: Not available (a-4, b-3, c-1, d-5, e-0, f-Report)

2454. ANONYMOUS, "Investigation into the Probable Error of MF/DF Loop Bearings by Night and by Day, Trial No. 201," Great Britain, Coastal Command Development Unit: Report No. 44/77; 2 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2455. CHENEY, M. G., AND SNOW, J. R., "The Blanket System of Anti-Direction Finder Communication - A Theoretical Investigation of Its Security Aspects," NRL Report No. R-2647; 5 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2456. ANONYMOUS, "Report of Interview with German Scientists," USN, ComNav for Germany: 6 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2457. ANONYMOUS, "Final Report on Time Difference Direction Finding," Marconi, Baddow Research Laboratories (British) Report No. CRB:46/1428; 15 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2458. ANONYMOUS, "Narrow-Band Receiver and Direction Finder," Army Air Force, Watson, Report No. ATSC 54; 16 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2459. ANONYMOUS, "Radio - Direction Finding - Type XCZ Direction Finding Equipment," USN, NRL Letter Report No. C-S67/69 (342 C-213-17/45, 16 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2460. ANONYMOUS, "Radio Set AN/CRD-6 Transportable Direction Finder," Army Air Force, Watson, Report No. ATSC 23; 16 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2461. ANONYMOUS, "Radio - Direction Finding - Model DBN HF/DF Radio Direction Finder - Final Report on," USN, NRL Letter Report No. C-S67/69 (342:MH)C342-155/45; 20 November 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2462. LOVEBERG, JR., A. C., "Reduction of Instrumental Error in Model DAB Direction Finding Equipment," NRL Report R-2672; 28 November 1945. See also Department of Commerce PB123380. ABSTRACT: 51 page report on tests and errors in the DAB direction finder equipment. (a-3 and 4, b-3, c-1, d-1, e-0, f-Test report)

2463. ANONYMOUS, "Final Reports-Part III, on Contract OEMsr-1441," Office of Scientific Research & Development Report No. 6280. See also Department of Commerce PB39572; December 1945. ABSTRACT: This volume contains six reports on service projects and other research conducted by the Central Communications Research-Craft Laboratory of the Harvard University. Included are reports on a study of FM vs AM for use in airborne VHF communication equipment; tests on direction finder systems; investigation of principles underlying the maximizing of communication intelligibility; aircraft-transmitter antenna-power, impedance and tuning network survey; measurement of magnetic properties of ferrite core materials; and disguised antenna for VHF, UHF and SHF communication equipment. Photographs, diagrams, charts and curves are included. (a-3, b-3, c-1, d-1, e-0, f-Report)

2464. ANONYMOUS, "Installation of Radio Set AN/ARC-3 and Radio Compass MN-26C," Army Air Forces, Air Technical Service Command, Engineering Division. See Department of Commerce PB18618; December 1945. ABSTRACT: This report consists of 15 photographs and 19 detailed drawings illustrating the method for installing the above mentioned radio equipment in an aircraft. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2465. ANONYMOUS, "Instrument Flying: Instrument Trainer, Instructors' Syllabus, Advanced," Army Air Force: TO-30-100C-3.

See also Department of Commerce PB34525; December 1945. ABSTRACT: This instructors' syllabus contains lesson plans for the following radio range; radio direction finding and the SCS-51 instrument approach system. Drawings, some of which are in color, illustrate the manual. (a-3, b-3, c-1, d-1, e-0, f-Instructions)

2466. ANONYMOUS, "Meterological Direction Finder," Joint Intelligence, Central Pacific Ocean Area; December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2467. ANONYMOUS, "Notes on the Reception of Vertically Polarized Electromagnetic Waves; Some Notes on Circuit Shielding," Radio, vol. 29, pp. 39-40; December 1945. ABSTRACT: A radio design work sheet. (a-4, b-2, c-1, d-1, e-0, f-0)

2468. ANONYMOUS, "Trials of High Frequency Direction Finder Outfit RH2X in H.M.S. Saltburn and H.M.S. Queen Elizabeth," Admiralty Signal Establishment: Report No. M.756; December 1945. ABSTRACT. The RH2X was an experimental coaxial spaced loop direction finder. (a-4, b-3, c-1, d-5, e-266, f-Report)

2469. BACHMAN, W. S., "Loop-Antenna Coupling-Transformer Design," Proc. Inst. Radio Engrs., N.Y., vol. 33, no. 12, pp. 865-867; December 1945. ABSTRACT: The low-impedance loop coupling transformer circuit is analyzed, expressing the transformer parameters in terms of the circuit and transformer coupling coefficients. Equations are developed which yield optimum design values for the transformer. It is shown that an ideal transformer-coupled loop has 38.4 percent of the gain realizable from a direct-connected loop of the same area, assuming the same Q in the transformer secondary as in the direct-connected loop. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

2470. ESSEN, L., AND OLIVER, M. H., "Aerial Impedance Measurements," Wireless Engr., vol. 22, no. 267, pp. 587-593; December 1945. ABSTRACT: The impedances of various cylindrical and conical aerials were measured by the resonant line method and are presented graphically. The dependence of the properties of a cylindrical dipole on its diameter is shown. The impedances of a conical unipole with a reflecting sheet and of a conical dipole are shown for the frequency range 200-1000 Mc/s. The apparent impedance of a cylindrical dipole fed from a concentric cable with and without a λ/4 balancing transformer is investigated. The accuracy of measurement is limited by reflections from nearby objects and by stray capacitances, and it tends to be poor when the measured resistance is of the same order as the characteristic impedance of the measuring line. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

2471. GIACOLETTO, L. J., "Radio Direction Finding Developments at 2nd Naval Research Laboratory," Department of Commerce PB L85720; December 1945. ABSTRACT: This memorandum contains tabulation of information on radio direction finders as abstracted by the Japanese from their research reports and should be considered as summary data only. Detail data can be obtained by translating the appropriate research documents all of which are supposed to be turned over to Technical Liaison and Investigation Division. It is the opinion of the author that there was nothing of intelligence value in the Japanese Navy's D/F research program. (a-3, b-3, c-1, d-1, e-0, f-Summary data, enemy equipment)

2472. HALL, S., "Navigating Light Plane with Loop," Western Flying, vol. 25, no. 12, pp. 38-40; 64, 66-67; December 1945. ABSTRACT: Advantages of directional loop are shown; as practical example of use of manual loop on typical cross-country flight, flight from Amarillo, Texas to Oklahoma City is traced. (a-3, b-2, c-1, d-1, e-0, f-Description - loop antenna and use)

2473. JADERHOLM, H. W., "Iron Powder Cores and Coils," Proc. IRE., p. 904; December 1945. ABSTRACT: When working with iron-core direction-finding loop antennas some time ago, the writer was greatly assisted in his understanding of the related permeability phenomena by the paper by R.M. Bozorth and D. M. Chapin. A perusal of article, which have since been published in various journals does not show any reference to this paper, but many repeat earlier "rule-of-thumb" methods. To this writer the paper seems worthy of some elaboration in respect to its application to the design of iron powder cores and coils for radio sets. Formulae for the effective permeability of a core and coil combination is derived from fundamental principles and is accurate for an infinite coil and core length. (a-1, b-1, c-1, d-1, e-0, f-Experiment)

2474. LE KASHMAN, L., "Saint's Direction Finding Approach Pattern," Aero Digest, vol. 47, p. 92; December 1945. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-Description)

2475. KENYON, R. W., "Principles of Loran in Position Location," Electronic Ind., vol. 4, no. 12, pp. 106-107; December 1945. ABSTRACT: Name Loran is derived from LOng RAnge Navigation and is descriptive of system that enables surface ship or aircraft to determine its position by radio, without necessity of radio transmissions from craft itself; operating principle and necessary equipment described. (a-3, b-2, c-1, d-1, e-0, f-Description)

2476. STIBER, S., "Report on the Development of Radio Set AN/TRD-2," U.S. Signal Corps Engineering Laboratory, Evans; Belmar: Report No. ESL-TM-1. See also Department of Commerce PB20595 and PB L60625; December 1945. ABSTRACT: Radio Set AN/TRD-2 was designed to provide a portable and mobile direction finder giving instantaneous indications and automatic sense. This direction finder is unique in that the instantaneous indication of the oscilloscope in a single line generated from the center of the screen of a length proportional to the signal strength, and the angular position of which indicates the direction of arrival of the signal without sense ambiguity. An additional feature is that noise and modulation are almost completely eliminated from the visual indication. Although capable of considerable mechanical and electrical refinement, the laboratory model performed in accordance with expectations, and to date is the only instantaneous direction finder developed in these laboratories which would be capable of operation when mounted in a vehicle as small as a jeep. Although the project under which the AN/TRD-2 was developed has been cancelled, recommendations are made as to possible applications and improvements, should investigation of this unique type of direction finder be resumed at a later date. The frequency range of this equipment is 1.5 to 18 mo. Photographs, drawings, and schematics are included. (a-3, b-3, c-1, d-1, e-0, f-Development)

2477. MIMNO, H. R., WING, A. H., AND CUNNINGHAM, W. J., "Terminal Report on Tests on Direction Finder Systems," Harvard University Report: OSRD: 6280; 1 December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2478. ANONYMOUS, "Radio-Direction Finding - Means of Determining Distance without Triangulation - NRL Problem S197R-C," U.S. Navy NRL:Letter No. S-S67/69 (342:RWA)5603; 7 December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2479. KRAUS, J. D., AND MCGUIGAN, W. D., "Interpretation of Calibration Data on Shipborne DBM (M4100) and Radar Direction Finder," Radio Research Laboratory Report No. 411-191. See also Department of Commerce PB L61003; 8 December 1945. ABSTRACT: Calibrations taken on 13 different naval vessels of various classes were made at frequencies in the range of 100 to 3400 megacycles for signals of both vertical and horizontal polarization. Individual calibration curves numbering more than 60 are included in an appendix, together with photographs and sketches of the various types of installations. Comparisons between installations are made by means of curves showing average deviation as a function of frequency. Curves are also shown of the deviation which includes 80 percent of the bearings as a function of frequency. In general, for average installations, deviations are larger at low frequencies than at high frequencies and larger on vertical polarization than on horizontal. The effect of location is discussed and it appears that in comparatively unobstructed locations, the overall average bearing deviation is about 3 degrees. Interpretation of the data on the basis of sectors is emphasized. It is stated that because of the obstructing and reflecting structures in the vicinity of the direction-finder antenna, there may be substantially greater deviations for signals arriving from certain directions or sectors. (a-3, b-3, c-1, d-1, e-0, f-Calibration)

2480. ANONYMOUS, "Status Report on Pony Project Model XDBO," Federal Telecommunications Laboratories, Nutley, N.J.; 9 December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-377 and 384, f-Report)

2481. YUDIN, M. I., "The General Case of Locating a Point on a Plane by Three Angle Measurements," Compt. Rend. Acad. Sci.

(URSS), vol. 49, pp. 472-475; 10 December 1945. ABSTRACT: An extension of the author's paper (Bull. Acad. Sci. (U.R.S.S.) ser. Geogr. et Geophys., vol. 8, nos. 2-3, p. 96 on; 1944. In Russian) to the case where the errors in angular measurement are not independent. Formulas are given which determine the position of the most probable point and the accuracy achieved. Aerodynamical and aural direction-finding applications are mentioned. (a-3, b-1, c-1, d-3, e-0, f-Theory)

2482. HALLER, F. F., "A Survey of Japanese Airborne Radio Research and Development," U.S. Army Technical Intelligence Center. Report No. 253, 19 December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2483. ANONYMOUS, "AN/APA-24A Direction Finder Antenna Assembly," Army Air Force: Report ATSC TSELP 26; 13 December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2484. DORWART, R. A., "A Narrative of Shipboard High Frequency Direction Finders in World War II," Naval Training School, Casco Bay, Portland, Maine; 15 December 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2485. BUSIGNIES, H., AND BAKER, D., "Study of Direction-Finder Fundamentals," Federal Telecommunications Laboratories, Nutley, New Jersey, Project No. C-58; Office of Scientific Research and Development Report No. 6608. See also Department of Commerce PB L87781; 17 December 1945. ABSTRACT: This final report is only a reference to and summary of the interim and project reports already distributed. (a-3, b-3, c-1, d-1, e-0, f-Study)

2486. TAYLOR, C. B. G., AND MACKINTOSH, L., "D/F Attachment to German K.W.E.A. Receiver," Telecommunications Research Establishment, Ministry of Supply (British) Report No. T. 1824; December 20, 1945. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2487. GEORGE, S. F., "Balanced Input Sensitivity Measurements Using Unbalanced Signal Generators," NRL Report R-2692; 21 December 1945. ABSTRACT: The problem of measuring the sensitivity of balanced input radio receiving systems with an unbalanced (grounded) standard signal generator is considered for the frequency range 1.5-30 megacycles. Particular emphasis is placed on the sensitivity measurement of direction finder systems employing goniometers with center tapped stators grounded through resistors, often difficult to remove. Three different approaches are discussed: (1) the employment of resistive networks for maintaining a balance, (2) the employment of unbalanced to balanced transformers and (3) the removal of the center tap and measurement as an unbalanced system. Results indicate that all three methods can be made to yield results in agreement within the limits of experimental accuracy. Two shielded balanced-to-unbalanced transformers were built with balance ratios of better than 50 db and coefficients of coupling of 0.93 and 0.91 for the low and high frequencies respectively (a-1, b-3, c-1, d-1, e-110, f-Measurements)

2488. ANONYMOUS, "Japanese Radio and Radar Direction Finders," U.S. Navy Technical Mission, Japan. See Department of Commerce PB48379 and PB L86873; 27 December 1945. ABSTRACT: This report contains technical information on several Japanese radio direction finders, compiled from information obtained from visits to a number of naval communications and electronic research centers and from interrogation of Japanese personnel connected with electronic field. Direction finders, as such were confined generally to ranges below 22 megacycles and were conventional in design, except for the Type 38 experimental land based and the Type 40 experimental shipborne equipments, which were a fair try in the direction of an instantaneous-reading visual-display type of direction finder. The Japanese had portable and mobile direction finders, but no information came to light on ultraportable types suitable for paratroopers. The directional antennae and lobe-switching devices used with radar intercept receivers afforded a means of direction finding at VHF and the lower radar frequencies and are covered in reports on radar countermeasures. See NavTechJap report "Japanese Radar Countermeasures and Visual Signal Display Equipment," Index No. E-07, and the references listed therein. Photographs, drawings, and diagrams are included in the present report. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2489. PINKHAM, R. A., AND KLEINBACH, W. S., "Reduction of Interference from the AN/APS-2F (ASG) Radar Equipment with Special Reference to the SCR-269F Automatic Direction Finder," NRL Report No. R-2686. See also Department of Commerce PB27048; 31 December 1945. ABSTRACT: The purpose of the problem reported here has been to determine the cause and magnitude of the subject interference, and to develop methods or means for its elimination. Investigation involving the AN/APS-2F and SCR-269F equipments has shown that the interfering radiation is mainly of two types. First, the high frequency carrier and its associated sidebands, and second, the pulse frequency and its harmonics. Only the latter has been found to be of practical importance. Laboratory investigation has led to modifications which reduce the interference to negligible values. Some of the modifications are accomplished by easily applied field correctives, while others are more difficult to make, but it is believed that the corrective measures suggested herein will be sufficient for the elimination of the interference. Finally, recommendations are made for improvement in the future design of radar equipments in order to provide for suppression of possible interfering radiation. Drawings, circuit diagrams, and photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Evaluation)

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2490. ANONYMOUS, "Direction Finder and Antenna Research," National Defense Research Committee, Office of Scientific Research and Development, Summary Technical Report of Division 13, vol. I, Contract OEMsr-1131. See also Department of Commerce PB139790; 1946. ABSTRACT: Nearly sixty years ago Heinrich Hertz experimentally produced electromagnetic waves, determined the direction of the waves, and wrote, "Thus we now have a means of discerning the direction of the electric force at every point." The waves were not detected outside of his lecture room, and it is unlikely that he foresaw the application of direction finding to navigation. Later, as the direction finder art advanced, many types of directional antennas were devised, including loops, crossed loops, spaced loops, Adcocks, and arrays. Some who contributed most effectively were Adcock, Ballantine, Barfield, Bellini, Busignies, Dellinger, Dieckmann, Eckersley, Heil, Kolster, Marconi, Mesny, Pickard, Smith-Rose, and Tossi. During the fifteen years prior to World War II, the art advanced relatively slowly. Most progress was made in England. Equipment performance was reasonably satisfactory. Ground installations of direction finders were used to inform ships at sea of their positions. A similar use of ground direction finders was made by Pan American Airways and by various European air lines. Direction finders on ships at sea were almost universally used as a navigational aid, and most commercial airliners employed automatic direction finders for navigation. Thus, by the advent of World War II, direction finding was established as an important means of navigation. Early in World War II, the Communications Division (Division 13) of the National Defense Research Committee [NDRC] formed a Direction Finder Committee under the Chairmanship of Loren F. Jones of which the members were H. Busignies, J. H. Dellinger, D. G. C. Luck, and R. K. Potter. Later, as consultants or technical aides, the Committee was greatly assisted by J. Allison, E. D. Blodget, and W. C. Lent. This Committee was active until September 21, 1945, with a number of Army, Navy, and British liaison representatives attending each meeting. During this period, the Committee issued contracts for work at Stanford University, California Institute of Technology, Harvard University, University of New Mexico, Federal Telephone and Radio Laboratories, Radio Corporation of America, Wilmotte Laboratories, J. A. Maurer, Inc., and Bell Telephone Laboratories. In addition, the Committee served as a coordinating agent and a clearing house for direction finder developments everywhere. The art advanced rapidly. Such diverse subjects as polarization errors, ionospheric effects, site errors, navigational applications, evaluation of fixes, and location of electric storms were studied. Despite its long history, direction finding has been the subject of remarkably few texts. For years, the standard text in English was Wireless Direction Finding by R. Keen, published in England in 1922 and now undergoing its fourth revision. Radio Direction Finders by D. S. Bond was published in 1944. The present publication, for which Keith Henney has acted as general editor and has devoted much time to coordinating the material, is Volume 1 of four books covering the wartime work of the Communications Division of NDRC. In this volume, there are accounts of developments sponsored by the Direction Finder Committee and of the results obtained. This book is not intended for the layman, and will be of only moderate assistance to equipment operators. It is intended for scientists, engineers, military personnel, students, and others who are interested in radio direction finding. Radar, which combines direction finding and ranging, is already extensively used for navigation. To some extent, it will replace direction finding. However, direction finding will remain as one of the primary navigational methods and will be used for new functions such as locating electric storms. As the art advances, developments will facilitate direction finding at higher frequencies, will minimize errors, and will simplify equipment. Recent progress made in these directions by NDRC is outlined in the following pages. The future holds promise of more radical developments, such as direction finders which will operate at all elevation and azimuth angles, in other words, hemispherically, with an accuracy adequate for fire

control purposes. Possibly all directions and frequencies will be under continuous uninterrupted observation with some kind of panoramic presentation. Possible there will be a need for direction finders with automatic tracking wherein the equipment will lock on and automatically follow a moving source of emission. No doubt there will be still other developments not now envisioned. All radio communication, of course, involves the proper design and use of many components, among them antennas. Direction finding, radar, altimeters, and countermeasures for jamming enemy radio communication require means for imparting to and receiving from space the required radio energy. For this reason it was natural that certain research on the design, measurement, and application of antennas should fall to Division 13 to sponsor. Following the material on direction finding will be found summaries of the several antenna projects supervised by the Division: HARADEN PRATT. In summarizing the several hundred reports of contractors on the hundred-odd research projects sponsored by Division 13 of the National Defense Research Committee, [NDRC], the editor has had to settle in his own mind how much or how little of each project report should be included, in other words, how far the boiling-down process should go. The editor has an abhorrence for seeing good scientific or technical material go unpublished. Only by publication can the facts or methods developed by a few researchers become available for all researchers. On this basis, substantially all Division 13's program should be included in the volumes, of which this is one, summarizing the work of the Division. On the other hand, time moves forward inexorably so that it is quite likely that, by the day of publication, much of the data would already be out of date. Furthermore, time and human energy are always scarce. On these bases, all that might be required would be a paragraph or two summarizing the aims of the project and its accomplishments. A middle course was steered, a course between the easiest solution of publishing practically all of each report and the more difficult job of really digesting the project purpose and results. The editor, however, deliberately chose to publish too much rather than too little. In most cases it will be unnecessary for the reader to search out the original source material unless he wishes to dig deep into the subject. In those cases where fundamental information was assembled and printed in the project report, that is, information on which future research might be based, the summaries have been permitted to take as much space as required. This volume covers two aspects of Division 13's work - that dealing with research and development in direction finding, and that on antennas. The work on direction finders has been divided broadly into two aspects, that describing physical equipment, and that covering fundamental research leading to better knowledge of the manner in which ground constants, multiple rays, polarization by the ionosphere, and other factors affect the accuracy with which bearings can be measured. All this was necessitated by the fact that direction finding had gone into a sort of intellectual slump by the beginning of World War II. Antennas were generally of the loop or the Adcock type. Errors in bearings were deplored but accepted. Need had not risen for direction finding on the higher frequencies which came into such wide use during World War II. Above all, new ideas, new and basic analytical research were needed. Throughout all the fundamental work on direction finding, the subject of errors was most important, simply because direction finders of various types do not give consistent nor accurate bearings in spite of the fact they can be erected with great care and constructed of precision apparatus. In fact, exploration of the vagaries of direction finding occupied a great deal of the attention of the Division and its research men and engineers. Finally, through the means of a new instrument, the polariscope, it was proved that many D/F troubles are due, not to the apparatus itself, nor to the ground on which it is located, nor to the operation of the equipment, nor to the fact that the ionosphere polarized radio waves heterogeneously. Many of the errors which would remain, even if all the other sources of difficulty were removed, come from the fact that radiation from a transmitter arrives at a receiving point over multiple paths, and it is the many possible interrelations between these multiple rays that produce direction-finding aberrations. Thus it appears that there is a point beyond which much greater accuracy in bearing determination cannot be obtained by refining the apparatus. Fundamental studies, analytical in nature, are reported rather fully in this report. Part I, dealing with basic studies in direction finding, includes means of measuring ground constants, and of rating D/F systems in terms of wanted-to-unwanted pickups; the effects of connecting cables with Adcock systems; a new means of controlling the amplification of a D/F receiver by means of a local transmitter; and the virtues of direction finding on pulse transmissions. Part II deals with physical equipment and systems developed under the aegis of Division 13. Here will be found the work which led to the SCR-291, a single-band of D/F system widely used by the Air Transport Service, a workable Radio-Sonde, a D/F system for the region of 110 to 600 mc, portable beacons which would lead a foot soldier to his objective on the field of battle regardless of weather or time of day, and means for locating tanks by radio. Finally, one of the last and most elegant accomplishments of the Division was an electrical and electronic instrument for evaluating the responses obtained from multiple D/F receivers so that the origin of signals could be more closely pinned down to a circle of small radius. Part III records early work of sferics, the use of radio direction finding for locating storms. The portion of the Division's activities dealing with antennas research is found in Part IV. Here is described the early work on determination of the characteristics of antennas for aircraft and tanks by means of scaled-down models: the work on faired-in antennas: a complete survey of airborne antennas as of early 1945, including what was then known about wide-band antennas. Work on disguised antennas, on improvised D/F antennas for use in the field, and on antennas for use in the region of 150 to 600 mc are also recorded here. KEITH HENNEY, Editor; Contents: BTL high-frequency direction-finder research; NBS high-frequency direction-finder research; Study of radio pulse propagation; Ultra-high-frequency direction-finding study; Errors in direction finders; Correlation of DF errors with ionosphere measurement; Miscellaneous direction-finder research; UHF radiosonde direction finder; Demountable short-wave direction finder; Direction finding by improvised means; Portable radio assault beacon; UHF direction-finding antenna study; Locating tanks by radio; UHF friendly aircraft locator; Electrical direction-finder evaluator; A study of sferics; Antenna patterns for aircraft; Airborne antenna design at UHF and VHF; Development of faired-in antennas; Miscellaneous antenna research. (a-1, b-3, c-1, d-1, e-855, f-Summary report)

2491. ANONYMOUS, "Historical and Technical Survey, Vol I and II," OSRD Report. See Department of Commerce PB92973 and PB92071; 1946. ABSTRACT: Volume I, 327 pages of photos, diagrams, graphs, and tables included in the text. Subject matter covers radar-research, radar-meteorological effects, radio waves, propagation and research, and the U.S. National Defense Research Committee. Volume II covers, in addition to subjects in Volume I, propagation experiments with radar transmission, radio transmission; 226 pages of similar content to Vol. I. (a-4, b-3, c-1, d-1, e-0, f-Technical survey)

2492. ANONYMOUS, "An Outline of Medium Frequency Direction Finding Systems," International Meetings on Radio Aids to Navigation, London; Document No. 10; 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Outline)

2493. ANONYMOUS, "Medium Frequency Direction Finding, (Shipborne)," International Meetings on Radio Aids to Navigation; Document No. 12; 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Survey)

2494. ANONYMOUS, "Summary Technical Report of NDRC Div. 13: Electronic Navigation Systems," National Defense Research Committee: Office of Scientific Research & Development, vol. 2B; 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Summary)

2495. BAKER, C. J., "Radio Investigation of Ionosphere," Philips Tech. Rev., vol. 8, p. 111; 1946. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

2496. BENNETT, G. M., "H.M.S. 'Boxer'," Wireless World, vol. 52, p. 3244; 1946. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

2497. CHRISTIANSEN, W. N., "Directional Patterns of Rhombic Antennae," A.W.A. Tech. Rev. (Amal. Wireless Aust.), No. 1, pp. 33-51; 1946. ABSTRACT: Spatial directional patterns of typical rhombic aerials are given. A design which involves the application of the simple "alignment" relation at the geometric mean of the frequency range is much superior at the higher frequencies to one in which a wider aperture has been used to obtain higher output at this mean frequency. A comparison with the pattern of a large tuned array shows the inferiority of a single rhombic aerial. Many of the prominent minor lobes seen in the directional pattern of the latter may be suppressed by the use of several rhombics in the form of an array. Various simple designs are discussed and it is shown possible, particularly when the rhombics are arranged in an interlaced "end-fire" array, to produce over the whole working range of the rhombic, a directional pattern which compares well with that of a large tuned array at its designed frequency. (a-2, b-1, c-1, d-11, e-0, f-Description)

2498. COLIN, R. I., AND ADAMS, P. R., "High-Frequency Direction-Finder," Communications, vol. 26, p. 50; 1946. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

2499. DIPPY, R. J., "Gee: A Radio Navigational Aid," JIEE, Part IIIA, vol. 93, no. 2, pp. 468-480; 1946. ABSTRACT NO. 1: A

"master" station transmits 6-microsecond pulses at a repetition frequency of 500 per second; two "slave" stations also transmit 6-microsecond pulses at a repetition frequency of 250 per second, and are locked to the "master" so that the interval between "master" and "slave" pulses remains constant. The signals are displayed on the airborne receiver so that the path difference from the aircraft to the "master" and each "slave" station can be read directly. Charts are provided with a system of hyperbolas of constant path difference plotted for the "master" and each "slave" station: the aircraft's position is then determined as an intersection of a hyperbola of each system. The airborne and ground-station equipments are described in detail. A later development was the introduction of a third slave station to give all-round coverage, and the design of light transportable ground stations. Future possibilities of the system are briefly discussed. A summary of this paper is given in Part IIIA, vol. 93, no. 1, pp. 344-345; 1946. ABSTRACT NO. 2: Three ground stations radiating pulses are used to fix the position of the receiver on a hyperbolic grid. Accurate fixes in all directions from the transmitters are obtained by adding a 4th ground station. The principles and circuits of the airborne equipment are discussed in detail and the ground equipment is outlined. (a_1-1, a_2-3, b-1, c-1, d-5, e-0, f-Description)

2500. DUCKWORTH, J. C., ET AL., Session on "Aerials and Wave Guides," JIEE, Part IIIA, no. 1; 1946. ABSTRACT: Papers presented at Radiolocation Convention as follows: Aerials for Radar Equipment, J. A. RATCLIFFE; Wave Guides, F. B. LLEWELLYN; Development of Ground Radiolocation Aerials, with Particular Reference to Height-Finding Systems, D. TAYLOR; Slot Aerials, H. G. BOOKER; Slotted Linear Arrays, D. W. FRY; Cheese Aerials, O. BOEHM; Production Testing of Wave Guides, L. W. BROWN, Wave-Guide Matching Technique, E. WILD; Phase Correction of Horn Radiators, N. M. RUST; Variable-Elevation Beam-Aerial Systems for 1-1/2 Metres, G. E. BACON; Dielectric-Lens Aerial for Wide-Angle Beam Scanning, F. G. FRIEDLANDER; Use of Common Aerial for Radar Transmission and Reception on 200 Mc/s. C. J. BANWELL; Some Applications of Principle of Variation of Wavelength in Wave Guides by Internal Movement of Dielectric Sections, G. E. BACON and J. C. DUCKWORTH; Detailed Experimental Study of Factors Influencing Polar Diagram of Dipole in Parabolic Mirror, E. G. BREWITT-TAYLOR; Impedance Matching by Tapered Transmission Lines, A. W. GENT and P. J. WALLIS; Elimination of Errors from Crossed-Dipole Direction-Finding Systems, R. A. SMITH and C. HOLTSMITH; Calculation of Attenuation in Wave Guides, S. KUHN; Quasi-stationary Field Theory and Its Applications to Diaphragms and Junctions in Transmission Lines and Wave Guides, G. G. MACFARLANE; Rhombatron Wave-Guide Switch, A. MACLESE and J. ASHMEAD; Directive Couplers in Wave Guides, M. SURDIN; Resonant Slots, W. H. WATSON. (a-3, b-1, c-1, d-5, e-0, f-Misc. papers)

2501. FEINBERG, E. L., "On the Coastal Effect in Radio Direction Finding," Bull. Acad. Sci. (U.R.S.S.), Ser. Phys., vol. 10, no. 2, pp. 196-216; 1946. ABSTRACT NO. 1: Previous investigations of the phenomenon are briefly reviewed; it is usual to ascribe the effect to the difference in the electrical properties of land and sea and to call it "coastal refraction." The author suggests that the actual vertical configuration of the coast also affects the propagation of electromagnetic waves since it is known, for example, that the difference in the electrical constants of land and sea is greater in the case of a high coast. Accordingly a more general theory is developed in which the effect of the boundary line is taken into account and formulas are derived for different relative positions of the observer and transmitter. The considerable effect of the transitional zone is also demonstrated. The theory is derived from a general theory of the propagation of radio waves along a nonuniform and uneven surface developed by the author elsewhere (1962 of 1944 and back references). That theory was based on an integral equation first solved by Grunberg (3386 of 1944) and more fully investigated by Fock in Mathematicheski Sbornik, 1-2 (1944). In the present paper a method is proposed which makes the solution of the integral equation unnecessary and the problem is reduced to the evaluation of integrals of known functions. This results in a considerable simplification of the necessary calculations. In conclusion, a brief analysis made of available experimental data, which are in conformity with the theory. ABSTRACT NO. 2: The directional error in degrees is calculated for different slopes of the coastal line and for different soil conductivities. The importance of location of transmitter and receiver is discussed. The computed formulas are extended to the general case of wave refraction. The proposed theory is shown to agree reasonably well with experimental observation by Smith-Rose and some Russian physicists. Equations for a plane wave crossing a non-rectilinear coast line are deduced, and experimental data are analyzed. (a_1-5, a_2-6, b-1, c-2, d-2, e-0, f-Theoretical analysis)

2502. FREEDMAN, S., "Two-Way Radio," Ziff-Davis Publishing Company, New York; 1946. ABSTRACT: A new book describes the mechanics and applications of two-way radio for all forms of fix. ., mobile, and portable communications. One chapter contains aeronautical applications of this equipment. The author discusses uses of aircraft radio and problems peculiar to it, design considerations, aircraft power supply, radio performance in aircraft, noise suppression, and direction finding. (a-2, b-6, c-1, d-1, e-0, f-Book)

2503. JACOBS, E. V., "Fundamentals of Radiolocation," Liverpool Eng. Soc. Trans., vol. 67, pp. 138-175, Disc., pp. 176-192; 1946. ABSTRACT: Principle of Radiolocation and other methods of range and direction finding; description of equipment; determination of range, azimuth or bearing, and elevation. (a-3, b-1, c-1, d-5, e-0, f-Discussion)

2504. PIPPARD, A. B., BURRELL, O. J., AND CROMIE, E. E., "The Influence of Re-Radiation on Measurements of the Power Gain of an Aerial," JIEE, Part IIIA, vol. 93, no. 4, pp. 720-722; 1946. ABSTRACT NO. 1: A modification of Purcell's method is given, taking account of reradiation which frequently introduces considerable errors. In the direct method of measuring power gain, reradiation errors are practically negligible. ABSTRACT NO. 2: While measuring the power gain of a sectoral horn by a method devised by Purcell, it was found that re-radiation caused serious errors unless precautions were taken to allow for it. The theory of the effect is developed and experiments are quoted which tend to confirm it. The mechanism of re-radiation is discussed for particular examples. A modification of Purcell's method is suggested, and it is shown that the direct method of measuring power gain is not seriously affected by re-radiation. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Re-radiation theory)

2505. POUT, H. W., "Precision Ranging Systems for Close-Range Weapons," JIEE, Part IIIA, vol. 93, no. 2, pp. 380-394; 1946. ABSTRACT NO. 1: The development of close-range sets is described and also the reasons for the successive changes. The prediction of aircraft future position is discussed, including analysis of "rate aiding" as a method of rate determination. Two sets are described, with block diagrams. The first of these, type 282, did not give the required accuracy. The second, type 285, incorporating panel L22, is described in detail and the problems associated with the use of panel L22 in conjunction with the auto-barrage unit are discussed. An account is given of a completely self-contained automatic set including auto-ranging and auto-aiming of the guns. The limitations of such a system are outlined. A summary of this paper is given in Part IIIA, vol. 93, no. 1, pp. 326-327; 1946. ABSTRACT NO. 2: Traces the development of naval close-range radar-ranging devices from 1939 to 1944, and describes the factors responsible for the successive changes. The prediction of aircraft future position is discussed with a mathematical analysis of "rate-aiding" as a method of rate determination. Reasons are given for the introduction of radar ranging into naval fire-control systems. Two ranging panels are described, and the special problems associated with their operation in conjunction with the auto-barrage unit are introduced. A description is given of the attempt to solve the close-range gunnery problem by the use of a self-contained gun mounting carrying all the necessary predictor and radar equipment. An auto-following radar set is analysed, and its advantages are discussed. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Survey)

2506. RELSON, M., "Direction Finders for Static Pulses," Electronic Ind., vol. 30, p. 32; 1946. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-0)

2507. RUSHCHUK, I. M., "Efficiency Comparison of Rhombic Aerials," Vestnik Elektroprom., vol. 17, no. 2, pp. 13-18; 1946. ABSTRACT NO. 1: The following rhombic aerials are compared: single rhombic, parallel rhombics in a broadside array, and a Russian variant of the latter due to Aisenberg. Power gain and its relation to radiation resistance is discussed, this being calculated by Poynting's vector method. It is shown that the Aisenberg array presents a great saving in space compared with the usual broadside, (spacing between the major diagonals is reduced to 0.8 λ) and still has 1.8 X power gain compared with a single rhombic. Another system is described, consisting of 2 parallel rhombics vertically mounted and having a reduced radiation resistance less than 485 ohms. A combined system of such arrays reaches a power gain of 210, and is much simpler than the Telefunken array with 32 + 32 elements of similar performance. ABSTRACT NO. 2: Mathematical discussion showing that the gain of a variation of the broadside rhombic aerial, as proposed by Eisenberg, is 1.8 times higher on short waves and 1.53 times higher on long waves than in the case of an ordinary rhombic aerial. (a_1-2, a_2-4, b-1, c-2, d-2, e-0, f-Discussion)

2508. SMITH, R. A., AND SMITH, C. H., "Elimination of Errors from Crossed-Dipole Direction-Finding Systems," JIEE, Part IIIA, vol. 93, no. 3, pp. 575-587; 1946. ABSTRACT: Radio direction-finding systems have mainly been used in conjunction with vertically-polarized radiation. For the detection of aircraft by radar on metre wavelengths, horizontal polarization has advantages and is normally used. The early technique, using a crossed-dipole system and goniometer suitable for horizontally-polarized radiation only is briefly described. The main sources of error in such systems are discussed. Special care must be taken to ensure that, when long feeders are involved, aerials are carefully matched to the feeders, to achieve this, accurate impedance measurements are required. Measurements on a dipole fed by twin concentric transmission lines are described, and it is shown how the impedance of stacked arrays may be calculated from these measurements. The need for careful bonding of transmission lines is discussed, and a design using heavy brass clamps to bond all feeders to a central lightning conductor is described. Errors due to reflector systems used for sense determination are discussed. A multi-element reflector system for use with stacked D/F arrays is described. The receiving aerials for the C.H. radar systems, as designed on the above principles and used for the determination of range, bearing and elevation of aircraft, are described. (a-2, b-1, c-1, d-5, e-0, f-Discussion)

2509. SMITH, R. A., "Radar Navigation," JIEE, Part IIIA, vol. 93, no. 1, pp. 331-342; 1946. ABSTRACT: The following radar navigational systems are described: interrogators and responder beacons for homing, "Rebecca" airborne interrogators operating with "Eureka" beacons (super-regenerative receiver), microwave beacons, "Gee," the hyperbolic system operating on 20 Mc/s, LORAN, the long wave long distance hyperbolic system for sea navigation, and its hf and sky wave synchronized versions; and the "direct" system H_2S (10 cm and later 3 cm wavelengths). High accuracy methods using direct distance measurement from two fixed stations G. H. and Oboe and the B. A. B. S. instrument landing systems are treated. For all these methods the principles of operation are explained, their meter or scope displays described and post-war applications discussed. (a-3, b-1, c-1, d-5, e-0, f-Description)

2510. TWIST, G., "Radio Direction-Finding, IEE Symposium," Electrician, vol. 137, p. 1213; 1946. ABSTRACT: Not available. (a-4, b-2, c-1, d-5, e-0, f-0)

2511. ANONYMOUS, "Digest of Lectures on Radio Aids to Navigation Given at R. A. E. November 19-22, 1945," Royal Aircraft Establishment (British) Technical Note No. RAD 343; January 1946 ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2512. ANONYMOUS, "Model DAE and Model DAE-1 Radio Direction Finder Equipment Instruction Book," USN, BuShips; January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2513. ANONYMOUS, "Wireless Direction Indicator: Japanese Signal Equipment," U. S. Army, Forces in the Pacific, Signal Analysis Section, Report No. 8 See also Department of Commerce PB23312; January 1946. ABSTRACT: Subject indicated is an adapter kit probably used for guiding troops at night or for amphibious landings. The contents of two boxes comprising the wireless direction indicator set are listed. Description states that frequency coverage is from about 900 to 1700 kc. (chart calibrated from 1000 to 1500 kc.). Photographs, a diagram, and extracts translated from the Japanese research book on the radio direction indicator are also included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2514. ACKERLIND, E., AND REYNOLDS, J. B., "Performance Study of an Experimental Iron Core Loop," USN, NRL Report No. R-2724; January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2515. ALFORD, A., KANDOIAN, A. G., LUNDBURG, F. J., AND WATTS, C. B., "An Ultra-High-Frequency Radio Range with Sector Identification and Simultaneous Voice," Proc. IRE, vol. 34, January 1946. ABSTRACT: The basis of the design described is the two-course localizer used in instrument landing. A group of three loop radiators provide two overlapping mirror-image patterns modulated at 90 and 150 c/s, respectively. A cross-pointer instrument, the vertical pointer of which is actuated differentially by the 90 and 150 c/s modulation, provides the pilot with the necessary information for orienting his plane. A second pair of outside radiators, similar but at right angles to the first group, in conjunction with the centre radiator, which is common to both the aural and visual systems, provides a keyed signal for aural sector identification. Except for the carrier radiation which is common to both the aural and visual signals, the two systems are entirely independent. Voice is radiated only by the centre aerial. The theory of the aerial system is discussed with particular attention to the problem of interaction between the aural, visual, and voice radiating systems. (a-3, b-1, c-1, d-1, e-0, f-Description)

2516. ANDREWS, V. J., "The Efficiency of a Short Transmitting Antenna," Communications, vol. 26, pp. 52-53, January 1946. ABSTRACT: The inefficiency of aerials of lengths less than 0.18 wavelength is due to the fact that they have a low radiation resistance and a large negative reactance, resulting in relatively high losses in the loading inductor. The adverse effect of the lead-in capacitance can be reduced by placing the loading inductor at the base of the aerial. (a-5, b-1, c-1, d-1, e-0, f-Theory)

2517. BRODZINSKY, A., "Aircraft Radio-Antiprecipitation Static and Iron-Core D. F. Loops, Performance of. Final Report," USN, NRL Report. See Department of Commerce PB28571; January 1946. ABSTRACT: This report was rendered by the Office of Research and Inventions, Naval Research Laboratory. Five different standard and experimental aircraft direction finding loops and loop housings were submitted to a comparative study. These included as standard loops the LP-21-A, LP-21-F, and the MN24C; and as experimental loops, the XAS-153/ARN, the AS-138/ARN, and the LP-21-A with a graphite impregnated housing. These comparative investigations covered pick-up sensitivity, susceptibility to precipitation static, and mechanical features such as wind drag, weight and ruggedness. The results of this study indicate that the experimental loops offer no overall improvement over the present standard loops except for the AS-138ARN (Fighter) which combines a very low drag factor with good sensitivity. Results are shown in photographs and are also tabulated. An appendix is added to cover in detail the measurement procedures used in these studies. (a-3, b-3, c-1, d-1, e-0, f-Report)

2518. CRANE, N. D., "Abstracts of German Research Documents of Signal Corps Interest," FIAT Report No. 677. See also Department of Commerce PB27533; January 1946. ABSTRACT: This report contains brief information on some 250 German classified research reports covering the field of radar, communications, radio control, navigational aids, propagation, direction finding, infrared and general high frequency technique. For each document an English title, the date of publication, author, brief abstract of its contents, number of pages, and diagrams and initials of the abstractor are given. It includes a document subject index. The documents themselves are now in the Intelligence Branch, Office of the Chief Signal Officer, War Department, as Documents numbers 20 to 250. The abstracts of numbers 214 to 250 were taken directly from the index cards of the Zentrale für Wissenschaftliches Berichtswesen Library. (a-3, b-3, c-1, d-4, e-970, f-Abstract collection PB No. suspended by ASTIA AD-51 987)

2519. KANDOIAN, A. G., LUNDBURG, F. J., AND WATTS, C. B., "Ultra-High Frequency Radio Range with Sector Identifier and Simultaneous Voice," Proc IRE, vol. 34, no. 1, pp. 9W-17W; January 1946. ABSTRACT: Range for aircraft enabling pilot to determine location of his plane with respect to a pre-determined course; description of radio-range based on 2-course localizer used in instrument landing, and comprising group of 3 loop radiators providing 2 overlapping mirror-image patterns modulated at 90 and 150 cycles, actuating cross-pointer instrument; associated aural system and antenna theory. (a-3, b-1, c-1, d-1, e-0, f-Description)

2520. MULLANEY, J. H., "The Half-Rhombic Antenna," QST, vol. 30. no. 1, pp. 28-31; January 1946. ABSTRACT: An elementary account of the construction and properties of the half-rhombic antenna, comprising an inverted-V aerial with a single-wire counterpoise. (a-6, b-1, c-1, d-1, e-0, f-Rhombics)

2521. PONTE, M., "On French Contributions to the Technique of Electromagnetic Detection (of Objects)," Ann. Radioelect., vol. 1, pp. 171-180; January 1946. ABSTRACT: Historical survey of radiolocation developments in France by the C. S. F. (Compagnie Generale de T. S. F.) and the S. F. R. (Societe Francaise Radioelectrique). In 1935 continuous-wave obstacle detectors on wavelengths of 80 and 16 centimeters were fitted to ships and installed at harbors giving ranges of about 5 kilometers on ship targets. In 1936 to 1938 higher-power magnetrons and pulse-modulation technique were developed: peak power 10 watts at λ16 centimeters with 6-microsecond pulses. Later developments included increase of power to 4 kilowatts on λ16 centimeters, use of 1-microsecond pulses, superheterodyne receivers with

cathode-ray indication, and horn radiators. A system installed at Toulon in 1942 gave ranges up to 25 kilometers on large ships with an accuracy of 25 meters in range and 2 to 3 degrees in azimuth. Systems on λ3 meters with a peak power of 25 kilowatts were also developed. The paper contains 18 photographs of the systems described. (a-5, b-1, c-3, d-3, e-0, f-Survey)

2522. RELSON, M., "Direction Finder," Electronic Industries, vol. 5, no. 1, p. 120; January 1946. ABSTRACT: According to the invention a rotating radiation pattern is frequency modulated with a frequency identical or an exact multiple of the frequency of rotation of the beam to make a phase-conparison possible. Upon amplitude and frequency demodulation, two signals are obtained in the receiver, phase comparison of which indicates the position of the aircraft with respect to the transmitter station. One carrier is sufficient for this system and no omni-directional radiation is required, the frequency-modulated rotating pattern carrying all necessary intelligence. In the transmitter the radio frequency oscillation is frequency modulated and then amplitude modulated by half the frequency-modulation frequency in two balanced modulators, the amplitude modulating waves being 90-deg.-out-of-phase. The outputs of the two balanced modulators are applied to the antenna system E, W, S, and N, which will radiate a figure-of-eight pattern rotating at angular frequency f, and frequency-modulated by an angular frequency 2f. A receiver located an angle θ from the reference direction, for instance θ degrees from east, will receive a wave of the form:

$$\cos(ft - \theta) \times \cos(\omega t + m_f \times \cos 2ft)$$

(The reference direction will be east, provided the maximum amplitude is applied to antenna E at the instant the maximum frequency deviation occurs.) After amplification, the received wave is detected as to amplitude and frequency in two different channels, the two resulting waves being cos 2 ft and cos (ft - θ), respectively. The discontinuities in the frequency demodulated wave, due to the amplitude modulation, will be overcome by the flywheel effect of inductance and capacitance in the circuit so that a substantially sinusoidal wave form will be achieved. The phase difference between the two waves may be indicated by the cathode-ray tube phase comparator or any other suitable phase comparator. In the embodiment illustrated, horizontal deflection is controlled by the FM discriminator output, vertical deflection by the AM detector output. A Potentiometer is adjusted so that the deflection of the cathode ray beam is symmetrical about the screen. Another Potentiometer is adjusted until the beam trace is above and just touches the horizontal diameter of the tube screen. A shield is then placed over the tube screen which covers it except for a narrow horizontal slit; the lower edge of the slit may be calibrated in degrees, 2θ or θ. In operation the cathode ray will appear through the slit only at the minimum of the amplitude detector output applied to the vertical deflection plates. The horizontal position of this trace at that instance depends on the instantaneous phase of the frequency-discriminator output applied to the horizontal plates; it will, therefore, be a measure of the phase difference between the two waves and consequently of the angle θ indicating the position of the aircraft with respect to the transmitter station. Another cathode-ray tube phase comparator is described, where the output of the frequency discriminator and a 90-deg.-phase-shifted version of it are applied to the two pairs of deflection plates respectively. A circular pattern results. The detected signal derived from the amplitude modulation is applied to the control grid of the cathode-ray tube, cutting the beam off during most of the cycle and permitting passage only during a short period of time while the signal amplitude is zero. Obviously a cardioid pattern instead of the figure-of-eight pattern may be employed if a non-directional radiation is emitted by an additional antenna erected in the center of the four antennas marked E, W, N and S. Operation of the system will be similar. Further frequency modulation may be replaced by phase modulation without any major change in the arrangement. Patent No. 2,384,789. (a-1, b-9, c-1, d-1, e-0, f-Description of patent)

2523. ROD, R. L., "Radio and Radar Aids to Aerial Navigation," Radio, vol. 30, no. 1, pp. 35-38; January 1946. ABSTRACT: Details of electronic aids to air navigation supplanting celestial or "dead reckoning" methods; radio range system employs narrow overlapping beams from route stations; loop direction finders; Loran system for locating position from pulses of separated "master" and "slave" transmitters; airborne radar search units giving pilot PPI presentation of terrain; radar beacon or racon system whereby aircraft signal triggers airport station reply. (a-3, b-2, c-1, d-1, e-0, f-Description)

2524. CARBENAY, F., "Aperiodic Combination of an Antenna and a Frame. Application in Direction-Finding to an Aperiodic Arrangement for Indicating Sense," Comptes Rendus, vol. 222, pp. 63-64; 2 January 1946. ABSTRACT NO. 1: The potential difference at the terminals of a small resistance at the base of an aerial can be written u = RCh dF/dt where R = resistance, C = aerial capacitance, h = effective height, F = vertical electrical intensity, t = time. The electromotive force in the frame is e = NS dH/dt where N = turns, S = area, H = horizontal magnetic intensity. The resultant of the two in series is zero or a maximum of RChc = NS where C = velocity which is a relationship independent of signal frequency. The arrangement is used in connection with atmospheric locators. ABSTRACT NO. 2: Aperiodic connection between antenna and frame can be applied to direction-finders of damped or unaltered waves. The application has been made successfully to localization of sources of atmospherics. (a_1-5, a_2-3, b-1, c-3, d-3, e-0, f-Theoretical analysis)

2525. ANONYMOUS, "Summary of Siting Requirements for HF/DF and VHF/DF Shore Stations," Admiralty Fleet Order No. 26 (British), 10 January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2526. CLARK, H. K., MCGUIGAN, W. D., AND MITZEN, C. A., "M7100 Direction Finder," Radio Research Laboratory Report No. 411-297; 10 January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2527. DANIEL, N. I., "Status of Development of Instantaneous Model of Single Ray Direction Finder," Signal Corps Engineering Laboratory, Evans, D/F. Technical Memo No. 2; 10 January 1946. ABSTRACT: This report describes the development and construction of a twin channel direction finder employing crossed tuned loops, instantaneous cathode ray presentation of bearing angle, and a circuit for the utilization of the dot/lock principle. Field test data is given from which it is tentatively concluded that this direction finder is superior to other direction finders tested on the basis of ability to operate in the presence of interfering signals, and ability to operate on signals having a high percentage of sky wave. (a-1, b-3, c-1, d-1, e-276, f-Description)

2528. U.S. DEPARTMENT OF COMMERCE, "Bibliography of Scientific and Industrial Reports," US Department of Commerce, vol. 1; 11 January - 28 June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2529. U.S. DEPARTMENT OF COMMERCE, "Index to Bibliography of Scientific and Industrial Reports," US Department of Commerce, vol. 1; 11 January - 28 June 1946. ABSTRACT: This is the index to the preceding cited bibliography. (a-4, b-3, c-1, d-1, e-0, f-Index)

2530. ANONYMOUS, "Preliminary Instruction Book for Radio Sets SCR-504-T3 and SCR-504-T4," US War Department; 15 January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2531. ANONYMOUS, "Radio - Direction Finding - Development of Model X-DAX - Contract NXsr-45457 - F. T. & R. Contractors - NRL Problem S927T-C - Evaluation of Model X-DAX Serial No. 2," USN, NRL Letter Report No. S67/69(1245: SRY) 1249-303/46; 16 January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2532. GEORGE, S. F., AND FLATH, E. H., "Sensitivity and Accuracy Comparisons of DAU Goniometers for DAJa Installation," USN, NRL Report No. R-2707; 20 January 1946. See also Department of Commerce PB123341. ABSTRACT: Report is primarily concerned with radar scanning. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2533. ANONYMOUS, "Japanese Signal Equipment Wireless Direction Indicator," Office of Commanding Signal Officer, Army Technical Intelligence Center, Tokyo, Japan, Report No. 8; 24 January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2534. GIACOLETTO, L. J., "Japanese Type 29 Experimental D/F Set," US Army Technical Intelligence Center, Tokyo; Signal Report No. 4. See also Department of Commerce PB17530 and PB52267; 26 January 1946. ABSTRACT: The set was experimented with by the Tokorasawn Branch of the Navy Technical Research Laboratory No. 2. It was constructed by Nippen Musen and shown typical German influence of design. It was intended for submarine installation and several submarines were actually equipped with the set while still in the experimental stage. The set covered the nominal frequency range of 115 to 15,000 kc. The Japanese refer to it as a double superhetro-

dyne, but actually it is a triple I. F. receiver with I. F.'s being automatically switched into the circuit by means of the band changes switch. The antenna employed was a single rotated loop with vertical antenna for sense determination. Aural null was used and typical sensitivity figures were cited. Front and near view photographs of the set are attached together with a circuit diagram and translated extracts from the Japanese engineering report on the receiver are included. (a-3, b-3, c-1, d-1, e-0, f-Enemy equipment)

2535. ANONYMOUS, "Instructions for Modifying Model DAQ Direction Finding Equipment to Include Automatic Gain Control," USN, NRL Letter Report No. RA69A 230A; 30 January 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification instructions)

2536. ANONYMOUS, Description of 225 - 390 Megacycle Scanning and D. F. Receiver and Indicator," Federal Telephone and Radio Corporation, Newark, New Jersey, Technical Memorandum No. 147; February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2537. ANONYMOUS, "Electronic Subdivision Advisory Group on Air Navigation (Ground Direction Finders)," Army Air Force Report: ATSC ED TS ELC-SP; Paper L-6; February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2538. ANONYMOUS, "High Frequency Direction Finders," USN, BuShips; February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2539. ANONYMOUS, "Introduction to a New Program for Direction Finder Research," Federal Telephone and Radio Corporation, Newark, New Jersey, Technical Memorandum No. 145; February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2540. ANONYMOUS, "Survey of Research Fields of Interest," Federal Telephone and Radio Corporation, Newark, New Jersey, Technical Memorandum No. 168; February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2541. NOWINSKI, S., ET AL., "Telecommunications in Germany-(1939-1945)," Federal Telephone and Radio Corporation, Newark, New Jersey, Technical Memorandum No. 149; February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2542. NOWOTNY, W., "Concerning Radio Direction Finding of the Airways," Elektrotechnik u Maschinenbau, vol. 63, no. 1-2, p. 20-30; January-February 1946. ABSTRACT: Radio avigation methods; development before and during war; principle of radio direction finding station and pilot beam installation; aircraft radio apparatus; prospect for civil aviation. (a-4, b-2, c-4, d-4, e-0, f-Survey)

2543. SPERRY GYROSCOPE COMPANY, "Microwave Instrument-Blind Landing System," Electronic Industries, vol. 5, p. 60; February 1946. ABSTRACT: Two beams, independently modulated, alternately turned on and off at 60 times per second, prevents interference. The important advantages of microwaves in producing sharply defined beams and in permitting the concentration of nearly all available radiation energy in exactly the desired space regions have been applied to a new instrument landing system. The general principle of operation is the same as originated by Diamond and Dunmore of the Bureau of Standards in 1928 and successfully applied at much lower frequencies. Briefly a glide path is established in space at a glide angle of about 2.5 deg. by the plane of intersection of two beams of energy. These beams both originate at the same spot close to the landing runway and one is directed upward at a slightly greater angle than the other. In the new system developed by engineers of the Sperry Gyroscope Company, the two beams are identical and the lower edge of the bottom beam is 1/2 deg. above ground at the half power point while the upper edge is 3 deg. higher. The beam center lines being 2 deg. apart, the plane of intersection is 2-1/2 deg. above level ground. Position in azimuth is determined by a similar beam intersection. This one, called the localizer beam, is produced in a vertical instead of a nearly horizontal plane. The intersecting beams are audio modulated 70% at 600 cycles and the upper at 900 cycles. The same scheme is used for the right and left beams of the localizer. The landing system operates 11-1/2 cm wavelength. The scheme used is to produce an intersection of radiated energy in two planes at right angles to each other and have the planes instrument indicate position right or left and above or below the track. (a-1 and 4, b-2, c-1, d-1, e-0, f-Description)

2544. WELLS, H. N., "Compass Locator Modification Kit MC-576 for Radio Transmitter BC-329-J," Army Air Force, ATSC Memo Report No. TSEL C4-38. See also Department of Commerce PB23514; February 1946. ABSTRACT: The purpose of this modification is to permit radio transmitter BC-329-J to transmit a tone-modulated signal for indentification. It is possible to utilize radio transmitter BC-329-J (25-watt LF control tower transmitter) as a compass locator, or homing beacon station provided automatic station identification and continuous tone-modulation is employed. In addition, a 100 ft. 3-wire flat top T-antenna and counterpoise system is required. Since after modification voice communication is not possible, the transmitter may not be used simultaneously as a low frequency control tower transmitter. Instructions for assembly and installation are given in detail. Blueprints are included. (a-3, b-3, c-1, d-1, e-0, f-Modification)

2545. ANONYMOUS, "Comparison of Sensitivity of Null and Switched-Pattern Types of D. F." Scientific Advisory Council, Ministry of Supply (British) Report No. AC8886; 7 February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2546. HORNBERG, K. O., AND NEWMAN, W. P., "Test of RCA UHF Direction Finder Developed under NDRC Contract OEMsr-1009, NRL Report No. R-2742; 11 February 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2547. ANONYMOUS, "Preliminary Instruction Book for Model DBC and DBC-1 Ultra-High Frequency Shipboard Direction Finding Equipment," USN, BuShips. See Department of Commerce PB38632; March 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instructions)

2548. ANONYMOUS, "Twin Bearing DF Unit," Elec. Ind., vol. 5, pp. 79, 124; March 1946. ABSTRACT NO. 1: Brief description of a compact, rotating, cross-loop, twin-channel direction finder with crossed-pointer indication - the Simon Radioguide, a variant of SCR-503-A. Frequency range 0.1 to 3.0 megacycles in two units. Messages may be read while bearings are being taken. ABSTRACT NO. 2. Brief description of Simon Radioguide enabling direction finding simultaneously with message interception from enemy aircraft, etc; device consists of crossed loop, twin channel direction finder using off-null loop position to provide aural reception and visual directional indication; equipment, powered by 12-v storage battery and dynamotor, is variant of US Army SCR-503A unit. (a_1-6, a_2-3, b-2, c-1, d-1, e-0, f-Description)

2549. BUDENBOM, H. T., "High-Frequency Direction-Finding Used in U-Boat Warfare," Electronics, vol. 19, p 304; March 1946. ABSTRACT: Still another wartime electronic device, the long-range high-frequency direction finder developed by the Federal Telephone and Radio Corporation, Newark, N. J., has emerged from curtains of secrecy, bringing to light a dramatic story of U-boat warfare. This d-f unit, capable of locating underseas craft even though they may be operating half way across the ocean, proved a worthy electronic teammate of radar in directing the Navy's escort ships and airplanes to victory over Axis submarines in the battle of the Atlantic, and now promises to be an invaluable postwar aid in increasing the safety of overseas passenger plane service. The effectiveness of the new direction finder depended upon the use of radios by enemy U-boats. So successful was secrecy on this development that Nazi submarines continued to use their radios even while this was leading to their location and destruction in rapidly increasing numbers. Enemy submarines used Kurier or squirt transmission - a system of radio communication in split-second bursts - to their bases in occupied territory, to one another in organizing their wolf-pack attacks, and in conveying weather information from this side of the Atlantic to the German high command. These compressed messages were picked up at the enemy receiving station on high-speed recording devices which later stretched the recorded message by playing it back at reduced speed. (a-1, b-2, c-1, d-1, e-0, f-Description)

2550. BUSIGNIES, H., "Evaluation of Night Errors in Aircraft Direction Finding - 150 to 1500 Kilocycles," Elect. Comm., vol. 23, pp. 42-62, March 1946. ABSTRACT NO. 1: This paper describes a method enabling pilots to determine the accuracy of night bearings obtained by radio compass in the frequency range 150-1500 kc and the effects when the plane passes through the combination of fields resulting from reflections from the E-layer or a mountainside. Elementary discussion is presented in the case of the night error on the ground and

at various altitudes, considering the simultaneous presence of (a) the direct wave, (b) the sky wave, and (c) the sky wave reflected from the ground. The night error is smaller at an altitude than on the ground; also there are certain altitudes at which the night error is reduced. ABSTRACT NO. 2: An elementary account of the production of night errors in a mw direction-finder located on the ground or at a height above the earth's surface, through the simultaneous presence of (a) the direct wave, (b) the sky wave, and (c) the sky wave reflected from the ground. The variation of the bearing as an aircraft moves through the complex field resulting from reflections from the E-layer or from a mountainside, is studied for the case of an aircraft using a spinning loop radio-compass. Rules are formulated for the correct interpretation of radio-compass indications. ABSTRACT NO. 3: Description of a method by which a pilot can determine the accuracy of night bearings obtained by aircraft radio compass and the effect of the aircraft's passing through fields resulting from reflections from the E layer or from mountains. Night error on the ground and at altitude is discussed, considering the simultaneous presence of the direct wave, sky wave, and sky wave reflected from the ground. All cases of polarization are examined briefly to indicate the numerous effects which may be encountered and a number of rules are given for direction finding at night over land and sea, with diagrammatic maps showing safe and unsafe areas of operation. (a_1-6, a_2-2, a_3-5, b-1, c-1, d-1, e-0, f-Theoretical analysis)

2551. CLIFFORD, V. F., "Report on Model X-DAY Direction Finder Equipment," Federal Telephone and Radio Corporation, Newark, New Jersey, Technical Memo No. 177; March 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2552. CRAMPTON, C., AND STRUSZYNSKI, W., "Factors Affecting the Accuracy of High-Frequency Direction Finding in H.M. Ships," Admiralty Signal Establishment (British), JRNS vol. 1, no. 4; March 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Analysis)

2553. DILLON, F. P., AND RICKETTS, N. G., "Radiobeacon System of United States Coast Guard," Nautical Gazette, vol. 138, no. 3, pp. 30-41, 48; March 1946. ABSTRACT: Detailed description of system operated and maintained by Coast Guard; place of radiobeacon system among other systems of aids to navigation; use of radio direction finders; location and distribution of radiobeacons; time schedules for sending signals; types of wave transmission; sources of error in radiobeacon navigation; equipment of radiobeacon station. Based on pamphlet by G. R. PUTNAM, issued by U S Dept. Commerce; 1931. (a-3, b-2, c-1, d-1, e-0, f-Descriptive survey. See Abstract No. 576)

2554. HORNER, F., "A Problem on the Summation of Simple Harmonic Functions of the Same Amplitude and Frequency but of Random Phase," Phil Mag., vol. 37, pp. 145-162; March 1946. ABSTRACT: The problem treated is the determination of the probability $P_n(s)$ that the amplitude of an arbitrarily chosen component of the resultant shall lie between the limits s and s + ds. Curves of $P_n(s)$ are given as functions of s for n = 1, 2, 3, and 7 where n is the number of harmonic functions involved in the summation. For large values of n, the distribution is of Gaussian form, and it seems likely that the lowest value of n for which the Gaussian curve gives a reasonably good fit is 5. The rms values of s are the same for the true and normal distributions for all values of n. (a-3, b-1, c-1, d-5, e-0, f-Theory)

2555. LUCK, D. G. C., "An Omnidirectional Radio-Range System," RCA Review, July 1941 to March 1946: (Three Parts). ABSTRACT: Part One: Radio navigation may be done with direction finding receivers on mobile craft, with fixed direction finders on the ground or with directional beacon transmitters on the ground. Each method has its unique merits and faults, but the last seems especially suited for aircraft guidance in the United States and has, in the form of four-course radio "range" beacons, rendered outstanding service. The disadvantages of limited choice of courses and of difficulty in definitely determining on which course a craft may be, inherent in the present four-course ranges, may be avoided by rotating a transmitted radio beam and timing its passage over the receiving craft, to determine uniquely the bearing of that craft from the known location of the beacon transmitter. A rotating beam, of figure-eight shape, may be produced without mechanical motion by setting up two fixed antenna systems, having figure-eight directivity, at right angles and feeding them with radio-frequency signals modulated at the desired rotation frequency, the modulation of the separate supplies to the two crossed antennas being in phase quadrature. Unmodulated carrier, to resolve the ambiguity of the figure-eight beam by changing its shape to a limacon is radiated from a non-directive antenna, and a timing reference is provided by interrupting all transmission momentarily just as the beam points north. The audio output from a receiver tuned to this beacon comprises a sine wave produced by the sweep of the beam and a train of impulses produced by the reference keying. The sine component is filtered, split in phase and used to drive a cathode-ray beam in a circle, in step with the rotation of the transmitted beam. The impulses are used to slow up the beam electrons momentarily, marking the swept circle with an outward jog and so indicating receiver bearing directly. The impulses also actuate a zero-center meter, while the sine wave renders this meter insensitive at a certain moment of the cycle and oppositely sensitive just before and just after that moment. By adjusting the sine wave phase, the meter may be centered when the receiver is on any desired bearing, and thereafter will indicate any departure from that bearing. A special broadcast transmission may be used to check adjustments of receiving indicators. Certain conditions as to modulation phases and amplitudes, antenna-current phases and amplitudes, antenna geometry and cathode-ray indicator voltage phases, amplitudes and tube geometry must be fulfilled if accurate bearings are to be obtained. Study of these conditions shows all adjustment tolerances to be of reasonable magnitude, though considerable care in antenna construction is necessary to insure adequate symmetry of antenna-current phase. Part Two: Experimental omnidirectional ranges have been developed and tested in flight at frequencies of 6425-kilocycles per second and 125-megacycles per second. In each case, a radiating system consisting of five vertical antennas and a metallic ground mat was used. Each transmitter was of a normal radio-telephone type, supplemented by a pair of balanced modulators, an impulse keyer, and a set of modulation controls. Full monitoring of the effect of all transmitter adjustments was provided. Essentially, normal aircraft receivers and antennas were employed. Both cathode-ray azimuth indicators and pointer-type deviation from course indicators were provided. Part Three: Tests of experimental omnidirectional ranges have been made at 6425-kilocycle and 125-megacycle operating frequencies. Ground measurements at the higher frequency showed directive-pattern shapes to be imperfect but acceptable and showed overall instrumental errors of indicated azimuth averaging less than one degree. Flight tests at both frequencies showed considerably larger errors, apparently related to terrain or transmitter-site characteristics. Sky-wave operation at the lower frequency was found fairly satisfactory in the absence of violent fading. Standing-wave effects were sought but not found in the ultra-high-frequency field. Trouble was experienced in the higher-frequency flight tests with spurious modulation of received signals produced by spinning propellers and imperfect structural bonding of aircraft, as well as with ignition interference. Behavior of the experimental equipment itself was on the whole satisfactory. Omnidirectional ranges may be used to fly straight radial courses to or from range stations, in which service the technique of their use is rather similar to that employed with other visual course-type ranges, or they may be used for general cross-country navigation following a uniquely simple technique. Omnidirectional ranges lend themselves well to safe air-traffic control. (a-1, b-1, c-1, d-1, e-0, f-Description)

2556. MACKINTOSH, J. E., "Direction Finder for Use in the 100 - 156 Mc/s Band," Royal Aircraft Establishment(British) Technical Note No. RAD 354; March 1946. ABSTRACT: Not available.(a-4, b-3, c-1, d-5, e-0, f-0)

2557. PIPPEL, "Direction of Currents on an Airplane Excited by Radiation," (German: ZWB) Report FB 1317. See also Department of Commerce PB85943; March 1946. ABSTRACT: This is a translation of the original report pertaining to German HF direction finders and their errors. Report consists of 23 pages including diagrams, drawings, and graphs. (a-4, b-3, c-1, d-4, e-0, f-DF errors)

2558. PERRIN, F. "Mutual Perturbations of Two-Loop Direction Finders," Onde Elec., vol. 25, pp. 101-106; March 1946. ABSTRACT: A study of perturbations and interaction between two-loop direction finders, and derivations of formulas to calculate this effect for cases of resonant loops and low-frequency loops. The following were given as practical figures: for two resonant loops, the minimum spacing must be eight times the diameter; for nonresonant or low-impedance loops, the minimum spacing must be four times the loop diameter. (a-6, b-1, c-3, d-3, e-0, f-Study)

2559. SCANDURRA, A., AND STIBER, S., "Visual Direction Finder," Electronic Industries, vol. 5, p 73; March 1946. ABSTRACT: Radio Set AN/TRD-2 is a Signal Corps development designed to provide a portable and mobile direction finder giving instantaneous indications and automatic sense. This direction finder is unique in that the instantaneous indication on the oscilloscope is a single line generated from the center of the screen with a length proportional to the signal strength and the angular position of which indicates the direction of arrival of the signal without sense ambiguity. An additional feature

is that noise and modulation are almost eliminated from the visual indication. Equipments of this type were useful during the rapid advance of the Allied armies in Europe. It was impossible for the field stations to supply maps at the pace maintained by mechanized infantry. This device provided a means for accurate land navigation. (a-2, b-3, c-1, d-1, e-0, f-Description)

2560. SCOTT, A., "Spot Location by HF/DF Data," Aero Digest, vol. 52, p 63; March 1946. ABSTRACT: Details released on highly improved system of high frequency radio direction finding, manufactured by Federal Telephone and Radio Corp. HF/DF, or "Huff-Duff" in military parlance, provides radio bearing or line of position on transmitted signal; it has been principally used for emergency work or navigation aid to any aircraft or ship desiring such information. (a-3, b-2, c-1, d-1, e-0, f-Description)

2561. SCROGGIE, M. G., "Decca Navigator," Communications, vol. 26, no. 3, pp. 21-24; March 1946. See also Wireless World, vol. 52, no. 3, pp. 93-95; March 1946. ABSTRACT: Operating principles; l-f radio direction finding system for instantaneous positioning check of ships and aircraft; equipment provides fix data by measuring time differences indirectly as phase difference in waves received from fixed transmitters radiating pure cw; comparison of Decca, Loran and Gee systems; use of long waves enables operation at great ranges with low power transmitters. (a-3, b-2, c-1, d-5, e-0, f-Description)

2562. SMITH-ROSE, R. L. AND HOPKINS, H. G., "The Application of Ultra-Short-Wave Direction-Finding to Radio-Sounding Balloons," Proc. Phys. Soc., vol. 58, part 2, pp. 184-98; March 1946. ABSTRACT NO. 1: The paper describes a method of determining the position of a radio-sounding balloon with the aid of two df's set a suitable distance apart. The paper is concerned with the accuracy of the df technique. Specially-designed df's of the rotating-loop type were used on two superior sites situated at the ends of a suitable base-line. ABSTRACT NO. 2: Describes the early portion of an investigation prior to 1939 into the possibilities of determining wind velocities at high levels by radio methods. An account of later work, leading to the practical techniques now used by the Meteorological Office will be published later. (a_1-6, a_2-2, b-1, c-1, d-5, e-0, f-Experimental study)

2563. LUCK, D. G. C., "Radio Direction Finder," Radio, vol. 30, p 29; March 1946. ABSTRACT: The article describes a method of compensating the transmission lines to a pair of directional antenna elements and hence a possible method of improving this type of antenna used in radio df. This invention refers to a shielded U Adcock consisting of two vertical antennas erected at points $1/2\lambda$ apart. Their connections are carried through shielded conductors of equal lengths to a push-pull connection at the input of a receiver. To prevent transmission lines from absorbing energy, they are shielded and buried. However, some rf voltage appears across the line (imperfect conductivity of ground and shield) and is capacitively coupled into the system. To correct this, compensating lines are connected. (a-6, b-2, c-1, d-1, e-0, f-Description of patented equipment)

2564. ANONYMOUS, "Japanese Navigational Aids," USN, Naval Technical Mission to Japan, Target E-05, No. 096; 14 March 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2565. SPICKLEMIRE, J. R., "Report on German Scientific Library of the BHF," Field Information Agency, Technical (FIAT) Final Report No. 753. See also Department of Commerce PB 27439; 15 March 1946. ABSTRACT: This report is a detailed index of the Library of the German Plenipotentiary for High Frequency Research. The Library contained some 2,400 selected classified research reports on high frequency technique, communications, radar and related fields. Titles are given both in English and in German. The documents were evacuated to the Central Radio Bureau, London, England, where they were microfilmed and individual abstract reports were prepared on each document. The original microfilm negative of the entire library together with copies of the abstract reports have been forwarded to the Joint Intelligence Objectives Agency, War Department, Washington. The original BHF filing system of separating the documents into 21 major classifications has been maintained, and the main sections have been further divided into subsections readily identified by the serial number of the extracts. Each document carries a serial number which identifies it as to main and subsection classification. (a-3, b-3, c-4, d-4, e-0, f-Bibliography index)

2566. ANONYMOUS, "Supplement to Digest of German Industrial Development," War Department, Supplement to (FIAT) Final Report No. 753; 15 March 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography. See preceding Abstract)

2567. ANONYMOUS, "Radio - Direction Finding - Model CXJH - Pitmoter Log. Corporation, New York, New York, Contractor - Pre-evaluation of - Problem No. 1298R-C-Interim Report on SSRD," USN, NRL Letter Report No. C-S67/69(1245)1240-44/46; 19 March 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2568. GORDON, W. E., AND WATERMAN, A. T., "A Study of Low-Level Meteorological Conditions and Their Relation to Angle-of-Arrival and Signal Level Measurements at Microwave Radio Frequencies, New Jersey, 1945." University of Texas, Electrical Engineering Research Laboratory, Austin, Texas, Report No. 1; March 23, 1946. See also Department of Commerce PB L58918. ABSTRACT: The radio and meteorological measurements were taken in northern New Jersey during August and September 1945. Facilities for measuring the angle-of-arrival of incoming radio waves at both 3.25 and 1.25 centimeters were established on a transmission path from Deal to Beer's Hill. Signal level records on these same two frequencies were also obtained on this path as well as on one from New York City to Mt. Neshanic. Low level meteorological soundings, involving measurements of air temperature and humidity at specified elevations, were made at Holmdel, Oakhurst, and Hadley airport. Wind speed records at these three locations and general synoptic weather charts supplemented the sounding data. Graphs included. (a-3, b-3, c-1, d-1, e-0, f-Study)

2569. ANONYMOUS, "Bibliography of British Reports on Radio for Civil Aviation and Radio Meteorology," Central Radio Bureau, London, Report No. 46/760; April 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Bibliography)

2570. ANONYMOUS, "Catalogue of Electronic Equipment," USN, BuShips; April 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Catalogue)

2571. ANONYMOUS, "D-F for Static Pulses,' Radio, vol. 30, p. 32; April 1946. ABSTRACT: The article describes, non-technically, the use of a df for locating storms and the origin of static. The df is a development of the University of Florida, A.A.F. Center at Orlando and the Evans Signal Laboratory at Belmar, New Jersey. (a-6, b-2, c-1, d-1, e-0, f-Description)

2572. ANONYMOUS, "Handbook of Operating Instructions for Radio Compass AN/ARN-6," Department of Commerce PB53906; April 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

2573. ANONYMOUS, "Hyperbolic or Lattice Navigation," Aeroplane, vol. 70, no. 1822, pp. 492-495; April 1946. ABSTRACT: Basic principles, present use, and future development of Gee, Loran, and Decca are covered. (a-3, b-2, c-1, d-1, e-0, f-Survey)

2574. ANONYMOUS, "The Effective Length of a Half-Wave Dipole," Wireless Eng., vol. 23, pp. 95-96; April 1946. ABSTRACT NO. 1: The equivalence of a dipole with sinusoidal-current distribution, and an aerial $1/2\lambda$ long carrying a uniform current equal to that at the center of the dipole, is not exact for points off the equatorial plane, and the field deduced therefrom is shown to be up to 5 or 6 per cent in error. ABSTRACT NO. 2: A half-wave dipole is usually assumed as an approximation to have a sinusoidal current distribution, and therefore to have an effective length equal to its actual length multiplied by $2/\pi$. This assumes that the field radiated by an aerial of this effective length carrying a current at every point equal to that at the centre of the half-wave dipole would be the same as that radiated by the dipole. This is true of the field strength in the equatorial plane - the direction in which we are often interested - but it is not strictly true in other directions. In the equatorial plane the radiation from all parts of the aerial arrives in phase and can be simply added; we then have

$$\hat{\mathcal{E}} = \hat{H} = \frac{4\pi}{10} \cdot \hat{i}\frac{h}{\lambda} \cdot \frac{1}{r}$$

where h is the effective height of the earthed quarter-wave aerial or the effective length of half the dipole and r the distance in centimetres. The current i is in amperes. Putting

$$h = \frac{\lambda}{4} \times \frac{2}{\pi} = \lambda/2\pi \text{ we have } \hat{\mathcal{E}} = \hat{H} = \frac{2\hat{i}}{10r}$$

It is interesting to note that this is exactly the same formula as that for the strength of the ordinary magnetic field H at a distance r from an infinitely long conductor carrying the same current I amperes. As one departs from the equatorial plane, however, the equivalence of the actual dipole and the aerial λ/π long, carrying a uniform current is no longer exact. This is due to the effects of phase displacement. Fig. I shows the equivalent to the half-wave dipole; its length is λ/π. In the direction shown the radiated field due to the element ds at a distance s from the centre is out of phase with that from the centre by an angle $(2\pi s/\lambda) \cos \theta$. Its effective component, i.e., the component in phase with that from the centre is $\cos [(2\pi s/\lambda) \cos \theta]$, and the mean value of this from $s = -\lambda/2\pi$ to $+\lambda/2\pi$ is easily seen to be $\frac{\sin(\cos \theta)}{\cos \theta}$. Hence the strength of the field at a distance r in this direction is not simply $\frac{2i}{10r} \sin \theta$ but $\frac{2i}{10r} \sin \theta \times \frac{\sin(\cos \theta)}{\cos \theta}$. In the Editorial of April, 1945, we showed that for the sinusoidal distribution of current along the dipole the field at a distance r was given by the formula $\frac{2i}{10r} \cdot \frac{\cos[(\pi/2)\cos \theta]}{\sin \theta}$.

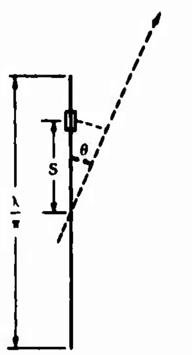

Fig. I.

It will be seen that as the result of the greater phase displacement, due to the longer length of aerial, the values are lower than those of the equivalent aerial. The difference is not very great, the ratio of the fields increasing from 1 per cent, for $\theta = 70°$ to about 5 or 6 per cent, for $\theta = 20°$. It can easily be shown that as θ approaches zero, the ratio approaches $(4/\pi)$ sin 1 radian, i.e., 1.071, but the values of the ratio for small values of θ are of little interest because little power is radiated in these directions. In the directions in which the greater part of the power is radiated the ratio varies from unity to about 1.03. The result of this is that, although the equivalent aerial gives the same field in the equatorial plane, its radiated power exceeds that of the half-wave dipole in the ratio of 80 to 73.2, these being the values of the radiation resistance which we obtained in the Editorial of April, 1945. (a-5, b-1, c-1, d-5, e-0, f-Editorial comment)

2575. CAFFERATA, H., "A Generalized Radiation Formula for Horizontal Rhombic Aerials," Part 2, Marconi Rev., vol. 9, pp. 64-69; April-June 1946. See also pp. 102-108; July-September 1946. ABSTRACT NO. 1: The reflection factor of an imperfectly conducting earth and the general radiation formula for a perfect earth are derived, and the general equation for radiation from the array is set out. To be concluded. ABSTRACT NO. 2: The formula expresses the radiation in any given direction in a spherical co-ordinate system at a large distance from a source which is composed of n horizontal rhombic elements in cascade and m cascades in parallel, all in the same horizontal plane. Arbitrary phase relations between cascades and elements are assumed, the attenuation of the current along the length of a conductor due to radiation is taken into account, and the effect of reflection from imperfectly conducting earth is included. The general formula is then applied to several particular cases. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Formulae)

2576. GRUPP, G. W., "Electronic Aids to Navigation," Motorship, vol. 31, no. 4, pp. 314-18; April 1946. ABSTRACT: War-born electronic devices including radar, Loran, Racon, and Anrac; Anrac system consists of control stations which transmit coded ultra-high frequency signals to special receivers on navigational aids; Racon system consists of electronic beacons placed on elevated shore positions to aid vessels equipped with radar; electronic system of navigation enables master to determine within few minutes position of vessel, irrespective of weather conditions. (a-3, b-2, c-1, d-1, e-0, f-Survey)

2577. MARKUS, J., "Huff Duff," Scientific American, pp. 155-156; April 1946. ABSTRACT NO. 1: Discusses some Federal Developed D/F equipment in use at the time. Enemy "squirt" transmissions are described. One instance of the destruction of a U-boat from D/F data is given. ABSTRACT NO. 2: Transoceanic pilots will be able, by means of "Huff-Duff", to obtain exact position fixes at any time... pin point locations of airplanes or ships in distress can be obtained, and rescue parties dispatched... new radar beacons will make distance - and direction-finding simple and speed up airport operations. A single dot or dash of the SOS call signifying tragedy at sea is sufficient to actuate a new high-frequency radio direction finder developed during the war by Federal Telephone and Radio Corporation. Though designed primarily to help the Navy in its battle against German submarines, the device quickly proved itself worthy of many other important applications, peaceful as well as military. In peace, this hf df (high-frequency direction-finding) system is being used to determine the positions of ships or aircraft and notify them of their location by radio. In war, it was used to locate the enemy and notify our naval forces of his location. In both cases, it gives an accurate bearing on high-frequency radio transmissions-something no previous direction-finding system could do satisfactorily. The new hf df instrument, popularly known as "huff-duff," picks up any voice or code radio signal transmitted on international short-wave communication channels, and within a split second shows visually on the screen of a cathode-ray tube the direction from which the signals are arriving. When such a bearing is obtained from two or more stations at different points ashore or afloat, a navigator can draw the lines of direction on a chart and read the position of the sending station at the intersection of the lines. One spectacular use of "huff-duff" in getting a U-boat was made by Task Group 22.8, which on Christmas Day, 1944, was ordered to hunt down and destroy a weather-reporting German submarine operating about 500 miles north of the Azores. On January 1, 1945, the U-boat was picked up by radio direction finder bearing, at an estimated distance of 40 miles. No successful contact was made. The following day two ships got a fix (crossed bearings) placing the submarine within 20 miles. Unfortunately, on January 9th the group was forced to depart for the Azores to refuel. On January 13th the hunt was resumed. Relying on df bearings, the U-boat was pursued south, north, and west as the bearings on his transmissions indicated changes of course. Persistence was rewarded on the morning of January 16th when the U-boat's radio transmission was intercepted by ships which fixed the enemy at six miles distant. The Task Group closed in for the kill. Two hours after the intercept, the sonar man picked up the U-boat. Exactly five hours after the intercept a violent underwater explosion indicated the end of another U-boat. Apparently this U-boat transmitted from a submerged position, because at six miles distance, radar had failed to locate it. The German use of the Schnorchel, the breathing device which permitted U-boats to run submerged and still charge their batteries and transmit radio signals, put a higher value than ever on radio direction finders, as bearings could be taken on transmissions made by submerged U-boats. Another outstanding accomplishment of the equipment, Navy officers recently disclosed, was the locating of the German submarines which landed spies and saboteurs on the Long Island and Florida coasts in the spring of 1942. (a_1-4, a_2-1, b-2, c-1, d-1, e-650, f-Description)

2578. NIESSEN, F., AND BOUWKAMP, C. J., "On the Error in the Determination of the Median Plane of a Radio Beacon in a Tilted Airplane," Philips Research Reports, vol. 1, pp. 161-168; April 1946. ABSTRACT: If an aeroplane which is provided with a vertical aerial is tilted round its major axis, not only vertical but also horizontal electric forces are received, and a determination of the median plane, which is based on the reception of vertical forces, is spoiled by the horizontal ones. The error made in this way is investigated. (a-3, b-1, c-1, d-12, d-0, f-Analysis)

2579. SCOTT, A., "New Four-Band Automatic Direction Finder," Air Transport, vol. 4, p 67; April 1946. See also Radio News, vol. 37, no. 6, pp. 68, 69, 128-130; June 1947. ABSTRACT NO. 1: A description is given and advantages are outlined of the new AN/ARN-6 automatic direction finder, developed by Fairchild Camera & Instrument Corporation. The improvements enumerated are as follows: weight reduced to 60 lb; a fourth band (100 to 200 kc) incorporated, thereby permitting the use of European and Asiatic range stations; designed to withstand high-altitude effects, tropical deterioration, and high humidity without change of electrical characteristics because of hermetically sealed parts; and the new loop control circuit, reported to give a bearing accuracy within 1°. ABSTRACT NO. 2: The Fairchild AN/ARN-6 dual remote-control automatic radio direction finder for aircraft is said to differ greatly in size and design from previous automatic models, making it a practical navigational instrument. It is designed for four-band operation, to cover all normal broadcast transmissions, including those of European and Asiatic stations and marine beacons in the range of 100-1,750 kc, and is sufficiently light in weight (60 lb) to be carried in the smaller types of planes. The new band is 100-200 kc, and the other three bands are 200-410, 410-850, and 850-1,750 kc. In addition to providing wide navigational aid, the new low-frequency band reduces difficulty from night and mountain effects. Components of the new unit are improved in performance

through hermetic sealing. Its iron core loop, transformers, and phasing vibrator are sealed in atmospheres of dry nitrogen. Since requirements in global navigation are varied and severe, especially where high-altitude flying is necessary, the model is designed to withstand high-altitude effects, tropical deterioration, and high humidity, which change electrical charact[illegible]istics. (a_1-2, a_2-2, b-3, c-1, d-1, e-0, f-Description)

2580. U.S. SIGNAL CORPS, "More on Sferics Storm Detector," Electronics, vol. 19, pp. 224-228; April 1946. ABSTRACT NO. 1: An account of a low-frequency (3.6 to 17.5 kilocycles) crossed-loop cathode-ray direction-finder receiver for instantaneous indication of sources of atmospherics. ABSTRACT NO. 2: Further technical details of the sferics detector for locating distant storm centers (ELECTRONICS, Feb. 1946, p 212) have been disclosed by the Office of the Chief Signal Officer. The equipment enables weather forecasters to plot storms across thousands of miles of ocean by detection of static electricity in thunderstorms, cloud masses, or rainfall. Experience proved that the sferics technique was not as effective in tropical climates as in more temperate regions. It was also found that nocturnal observations were significantly less accurate than those made in the daytime. And due to the comparatively low frequency of the sferic impulses (7 to 10 kilocycles), deflection of the ground wave causes a considerable factor of error, especially in coastal locations. Another element of error is introduced when the direction finders pick up low-frequency communication transmissions simultaneously with sferic impulses. As used by the Signal Corps, each sferics set weighs about 450 pounds and costs about $5000. The frequency range of the latest model is 3.6 to 17.5 kilocycles. Most radiodirection finders are designed to detect continuous-wave signals which are sufficiently enduring in time to permit the determination of direction by rotation of an antenna. The detection of sferics obviously poses greater problems, and the static direction finder is engineered with two separate antennas which do not rotate. The two loop antennas are erected at right angles to each other so that the plane of one is perpendicular to the north-south direction and the plane of the other is perpendicular to the east-west direction. Each antenna consists of 400 turns of wire wound inside a waterproof aluminum shield. The output voltage of each loop is coupled to identical but separate high-gain amplifiers, which are designed to produce identical output voltages in response to equal stimuli. The output voltages of the amplifiers in turn are coupled to the deflection plates of the oscilloscope. When the loops are mounted at right angles to each other, signals arriving along the ground produce in each loop a voltage whose value is determined by the strength and angle of approach of each received signal. (a_1-5, a_2-1, b-2, c-1, d-1, e-0, f-Description)

2581. SPRIGGS, J. O., AND ARNETT, H. D., "Direction Finder Requirements for Submarine with Special Reference to the Use of the SV Radar Reflector," USN, NRL Report No. R-2689. See also Department of Commerce PB122783; 9 April 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

2582. LIBBY, R. L., AND THRIFT, S. R., "Interim Report of Test of Model CXGJ-4 (DBT) Shipborne VHF Direction Finder," USN, NRL Report No. R-2801. See also Department of Commerce PB109483; 10 April 1946. ABSTRACT: A 71 page report dealing with the test of the CXGJ-4 D/F equipment, and VHF radio direction finders in general. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2583. GRUBER, J. R., AND FLATH, E. H., "Requirements of Direction Finders Indicator and Determination of Correct Scanning Rates for DF Collector Systems in the VHF, UHF, and SHF Bands," NRL Report R-2648; 11 April 1946. See also Department of Commerce PB122771. ABSTRACT: This report contains an analysis of the operation of four (4) basic direction finding systems against signals in the VHF, UHF, and SHF bands. In particular, the parameters which determine the correct D/F scanning rate are discussed for the case where the signal is pulsed and emanates from a rotating, directional antenna. The mathematical probability of obtaining a bearing against radar signals with different D/F systems is presented and examples of such calculations are given. It is shown that the probability of obtaining a bearing during one (1) sweep of a scanning radar transmitter increases as the D/F scanning rate is increased. It is also shown that the maximum usable D/F scanning rate is determined by the pulse repetition frequency of the received signal. The requirements and limitations of D/F indicators for use with the above systems against pulsed signals are discussed. It is found that proper design of the indicator circuits will minimize deficiencies and possible bearing errors. (a-1, b-3, c-1, d-1, e-123, f-Analysis)

2584. ANONYMOUS, "Final Report on Flight Test of Prototype Relocation of Antenna for Airborne VHF Radio Receiving and Homing Equipment AN/APR-2A in F8F-1E Airplane," USN, Naval Air Station, Patuxent; 12 April 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2585. ENTWISLE, P. V., "Interim Report [illegible] Problem of Obtaining D/F Bearings on Radar Equipment over [illegible] Screening," Radar Research and Development Establishment, M[illegible]y of Supply (British) Report No. 310; 15 April 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2586. GIROUD, P., "Le navigateur 'Decca'," J de la Marine Marchande et de la Navigation Aérienne, vol. 28, no. 1373, 1374, pp. 392-393; April 11, 1946: pp. 420-422; April 18, 1946. ABSTRACT: Illustrated description of "Decca" navigator; principle of apparatus by means of which geographic location of any object can be determined almost instantaneously is explained with aid of charts. (a-3, b-2, c-3, d-3, e-0, f-Decca description)

2587. THOMPSON, A. G., "Model DBD Medium Frequency Direction Finder Equipment for Small Craft," USN, NRL Report No. R-2754; 15 April 1946. See also Department of Commerce PB120719. ABSTRACT: This 24 page report consists of a description of the use of type DBD direction finding, the Radio Compass type SCR 269-F, and photos and drawings pertaining to same. (a-4, b-3, c-1, d-1, e-0, f-RDF-Model DBD)

2588. STAGE, H. C., "Design Features of a Compact Spinning Loop Type Direction Finder for the MF and HF Ranges," NRL Report No. R-2847. See also Department of Commerce PB46557; 30 April 1946. ABSTRACT: The preliminary design of a compact and efficient spinning loop type direction finder, covering the entire 0.25 mc/s to 30.0 mc/s frequency band, has been developed. This new equipment is intended as a replacement for the two crossed loop type direction finders (models DAK and DAQ), now required to cover the same frequency band. The new spinning loop equipment will carry the Model DBH designation. It includes: An all band 8-tube superheterodyne receiver tuning from 0.25 to 30 mc/s; an indicator unit giving standard twin leaf automatic bearing presentation, including sense; optional panoramic reception presentation; an airborne type spinning loop assembly; and a remotely tuned preamplifier. Important new features of this equipment are: An efficiently tuned spinning loop collector; provision for automatic band change and tuning of the remote loop amplifier; remote positioning of the antenna loop to any desired azimuth for use in minimizing the jamming effects of another strong signal on the same frequency; and provision for conveniently adjusting the sense antenna balancing condenser from the receiver operating position. Detailed functional block diagrams, schematics, and three photographs are included. (a-3, b-3, c-1, d-1, e-256, f-Description)

2589. ANONYMOUS, "Journal of Technical Development No. 10," Royal Aircraft Establishment, Ministry of Aircraft Production (British) Report No. JTD 10; May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2590. ANONYMOUS, "Position Fixing Equipment, Type: Special 2135N," (German: Telefunken); May 1946. See also Department of Commerce PB L67754. ABSTRACT: This document contains the description and instructions for the use of a device for correcting errors in direction finding operations. It consists, in principle, of a transparent sheet imprinted with a compass card and distance meter scaled according to the map used. Photographs included. (a-3, b-3, c-4, d-4, e-0, f-Description)

2591. ANONYMOUS, "Radio Navigational Aids," Engineering, vol. 161, no. 4191, pp. 451-452; May 10, 1946. See also Engineer, vol. 181, no. 4713, pp. 425-427; May 10, 1946: Mar Engr. vol. 69, no. 827, pp. 354-355; June 1946: Wireless World, vol. 52, no. 6, p. 201; June 1946. ABSTRACT: One of principal objects of international meeting on Radio Aids to Marine Navigation in London is to inform other countries of what has been done in United Kingdom during past few years; certain prototype models installed in HMS Fleetwood to be demonstrated to visitors during meeting; details of rotating beacon system, Gee system, Decca navigating system, Consol system, and radar system. (a-3, b-2, c-1, d-1, e-0, f-Survey)

2592. ANONYMOUS, "Test of MF/DF Direction Finder Equipment

Model DBD," USN BuShips; May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2593. BAILEY, D. K., "Report on Japanese Research on Radio Wave Propagation," Office of Commanding Signal Officer, GHQ U.S. Army Forces, Pacific, Tokyo, Japan; May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-Report)

2594. HALLIDAY, D. F., AND KIELY, D. G., "Dielectric Rod Aerials," Admiralty Signal Establishment (British) Report No. M.770; May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2595. JOHNSON, H. F., "Model DAK-2 D/F Loops at Shore Stations," U.S. Coast Guard, Report No. R-163-6; May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2596. KANDOIAN, A. G., "Coaxial-Feed FM Loop Antennas," Electronic Industries, vol. 5, no. 5, pp. 74-76; May 1946. ABSTRACT: Design considerations of several types of easily fed directive antennas applicable to F/M, developed by Federal Telephone & Radio Laboratories; uhf antennas, which are of square loop construction, give high degree of directivity in vertical plane while maintaining complete ommi-directivity in horizontal plane; data on bandwidth stacking characteristics and other features. Bibliography. (a-3, b-2, c-1, d-1, e-0, f-Fabrication)

2597. MAUTNER, L., "Simplified Input Impedance Chart for Lossless Transmission Lines," Communications, vol. 26, pp. 44-45, 26; May 1946. ABSTRACT NO. 1: A chart giving the range of input impedance for lines of length $n\lambda/8$ terminated resistively and reactively. ABSTRACT NO. 2: Chart and explanatory data is presented which offers rapid appraisal of input impedance of lines lengths commonly used for various types of terminations. Material is taken from author's book "Mathematics for Radio Engineers." (a_1-5, a_2-3, b-2, c-1, d-1, e-0, f-Transmission lines)

2598. PIERCE, J. A., "An Introduction to Loran," Proc. IRE, and Waves and Electrons, pp. 216-234; May 1946. ABSTRACT: The first part of this paper on loran navigational equipment describes the history of loran's development as an example of the efficient "mass production" of research and development under the National Defense Research Committee. A second section deals with the fundamental concepts of hyperbolic navigation and gives some details regarding the kinds of equipment now employed for transmission, reception, and interpretation of pulse signals for this service. The third part of the paper discusses the potential usefulness of hyperbolic navigation and suggests some of the many devices that will simplify the navigation of the future and enhance its reliability. The final section mentions the present organizational problem involved. (a-2, b-1, c-1, d-1, e-0, f-Loran)

2599. PIERCE, J. A., "2-Mc Sky-Wave Transmission," Proc. IRE, vol. 34, no. 5; May 1946. See also Electronics, vol. 19, pp. 146-153; May 1946. ABSTRACT NO. 1: A simplified review of present ionospheric knowledge, with particular reference to loran operations and the effect upon the sky-wave delay times of reflections at the E and F layers. It is shown that the E layer is relatively stable, is little affected by ordinary disturbing pheomena, and can be used for loran operations at medium and long ranges. ABSTRACT NO. 2: Describes growth and history of Loran research, fundamental concepts of hyperbolic navigation and details the kinds of equipment employed for transmission, reception, and interpretation of the pulse signals. It discusses other devices to simplify navigation in the future, and organisational problems to be solved. (a_1-5, a_2-4, b-1, c-1, d-1, e-0, f-Review)

2600. ANONYMOUS, "Radio - Direction Finding - Model DAQ High Frequency Direction Finder Installations and Calibrations - Facilities for," USN NRL: Letter Report No. C-S6/67(372); 4 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

2601. ANONYMOUS, "Electronics - MF/DF Radio Direction Finder Equipment Model DBD Serial X-1, Final Type Test Report," USN NRL Letter Report No. C-S67/89, C-310-204/45; 7 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2602. WEIDEMANN, H. K., AND HEUSINKVELD, M., "Modified M6807 Antenna for 2200-3800 Mc Frequency Range," NRL Report R-2827; 7 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2603. ROTHSCHILD, M., "Search and DF Tests on Radar Sets AN/TPS-3, SCR-584 and Small German Wurzburg When Used as Mortar Locators," Signal Corps Engineering Laboratory, Evans, Technical Memo. No. 198-R; 9 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2604. ANONYMOUS, "Automatic Radio Direction Finder Type P.V. 1," International Telecommunications Laboratory, Inc., LPR No. 100, Issue A; 13 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2605. BROOKS, F. E., AND TOLBERT, C. W., "Equipment for Measuring the Angle-of-Arrival by the Phase Difference Method," University of Texas, Electrical Engineering Research Laboratory, Report No. 2; 16 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2606. ANONYMOUS, "Some Fundamental Data on the Operation of the Loop Antenna as a Direction Finder," Ohio State University Research Foundation; 22 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2607. BURROWS, C. R., "Present Status on University of Texas Angle of Arrival Experiments," University of Texas, Electrical Engineering Research Laboratory, Report TIP:238 D-10; 22 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Progress report)

2608. HAMLIN, E. W., "Preliminary Report on Phase Front Measurements in Arizona During April 1946," University of Texas, Electrical Engineering Research Laboratory, Report No. 6P; 22 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2609. HAMLIN, E. W., AND STRAITON, A. W., "Theoretical Treatment of Phase Difference between Two Vertically Spaced Antennas for Straight Line Propagation over Flat Earth," University of Texas, Electrical Engineering Research Laboratory, Report No. 3; 22 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

2610. ANONYMOUS, "BIOS Inter. Rpt. No. 115," British Intelligence Objectives Subcommittee Interim Report No. 115, 29 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2611. ANONYMOUS, "Electrical and Mechanical Engineering Regulations Telecommunications L802 and L812/2 [Adcock Transportable DF Stations Lightweight Adcock Aerial System (Tropical) and D/F Stations, Mobile BC Nos. 2A and 3(T)]," U.S. War Department: M.A.R., London; R294-46; 31 May 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

2612. ANONYMOUS, "Decca Navigator," Electronic Engineering, vol. 18, pp. 166-171; June 1946. ABSTRACT: Details given of Decca navigation system which depends on time differences from pairs of transmitters and uses same type of hyperbolic grid as Gee system; however, time differences are measured at receiver as phase differences in unmodulated cw signals from transmitters; this enables receiver to be so designed that grid coordinates can be accurately read off pair of dials rather easily; ranges well over 1000 mi have been obtained with low power. (a-3, b-2, c-1, d-1, e-0, f-Description of Decca)

2613. ANONYMOUS, "Instructions for the Siting and Calibration of H/F and V.H/F Equipment," Admiralty Signal Establishment (British) Radio Equipment Department, Report BR-1464; June 1946. ABSTRACT: The following instructions have been compiled with special reference to the siting of HF and V.HF equipment for permanent R.N.A.S. Guidance is also given in the choice of D/F sited for long range D/F purposes by indicating their (more stringent) requirements in brackets. The instructions apply particularly to HF D/F outfit AH6 and V.HF D/F outfit FV4S, which outfits employ Adcock aerial systems designed

to give reliable bearings on badly polarised waves, such as aircraft transmissions and sky wave often are. (a-1, b-3, c-1, d-5, e-216, f-Instructions)

2614. ANONYMOUS, "Iron Cored D. F. Loops and Manufacture of Iron Dust," British Intelligence Objectives Sub-Committee Report No. 1203, Op-32-F2-M-507-47, June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2615. ADAMS, P. R., AND COLIN, R. I., "Frequency, Power, and Modulation for a Long-Range Radio Navigation System," Elect. Commun. vol. 23, pp. 144-158; June 1946. ABSTRACT: The transmission frequency or range of frequencies most suitable for the system is considered. Reception must be assured within a radius of 1500 miles from each ground transmitting station regardless of hour, season, weather, or location to enable the navigator always to determine his geographical position. The HF and LF bands are discussed, the latter being analysed in detail. A study of experimental data and consideration of signal and static strengths and fluctuations, and aerial efficiency, indicates that, for a max distance of 1500 miles, assured reception can be obtained with min power input at a transmission frequency of ~ 70 kc/s. Power requirements for several locations are estimated, and the sizes of aerials for handling such power without corona are discussed. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

2616. BURGESS, R. E., "Iron-Cored Loop Receiving Aerial," Wireless Eng., vol. 23, pp. 172-178; June 1946. ABSTRACT NO. 1: The complex effective permeability of a mass core is expressed in terms of the relevant factors, and the imaginary part is related to the eddy current loss in the particles, which should predominate over other components of loss. The increase of pickup due to a spheroidal core is calculated and it is shown that the core should be elongated in a direction parallel to the axis of the loop. The effect of a hollow spheroidal core is discussed and it is found that in a typical case 80 per cent of the iron can be removed before the increase of pickup is halved; the effect of spacing the winding from the core is treated approximately. Recommendations are made regarding the design for maximum sensitivity. An editorial comment (G. W. O. H.) appears in the same journal, pp. 156-157. ABSTRACT NO. 2: The main features of the iron-cored loop are treated. The complex effective permeability of a mass core is expressed in terms of relevant factors. It was concluded that (1) the core should have high permeability; (2) the core should be elongated in the direction of the axis of the loop; (3) the particle size (iron particles) should be small to minimize eddy-current loss; (4) the core should be hollow to save weight; (5) the loop should be spaced from the core to decrease dielectric loss; (6) the loop should be designed for minimum copper loss. Curves and calculations for design of cores for high pick-up are given. (a_1-1, a_2-6, b-1, c-1, d-5, e-46, f-Derived from British report dated 15 November 1941. See Abstract No. 1368)

2617. BUSIGNIES, H., ADAMS, P. R., AND COLIN, R. I., "Aerial Navigation and Traffic Control with Navaglobe, Navar, Navaglide and Navascreen," Elect. Commun., vol. 23, pp. 113-143; June 1946. ABSTRACT: The Navaglobe system of long-range navigation uses a world-wide network of LF continuous wave transmitters providing signals which automatically control azimuth instruments enabling pilots to determine their positions. Navar is an application of radar and airborne responder beacons providing ground surveillance as well as distance and azimuth indications in the cockpit; Navaglide is a microwave system for instrument-controlled landing and automatic landing. The Navascreen system integrates all available information concerning aircraft positions and movements into a large-scale clearly readable display. (a-3, b-2, c-1, d-1, e-0, f-Description)

2618. ROBERTS, W. VAN B., "Long-Wire Antennas," QST, vol. 30, pp. 36-39; June 1946. ABSTRACT: A simplified qualitative treatment of the operation of rhombic and V aerials. The power gains of the rhombic and the half-wave dipole are compared. (a-5, b-1, c-1, d-1, e-0, f-Rhombics)

2619. TOCZYLOWSKI, H. S., "An Investigation of Transmission Lines, as Applied to the Six-Crossed Loop D/F System for Naval H/F D/F Outfits," Admiralty Signal Establishment (British) Report No. M. 771, June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Study report)

2620. PAGE, L., "The Magnetic Antenna," Phys. Rev., vol. 69, pp. 645-648; 1-15 June 1946. ABSTRACT NO. 1: The antenna investigated is an infinitely long cylindrical rod (radius a, permeability μ, permittivity 1,) with a few turns wound around the center. The increase of flux is given by equation (14) and is shown graphically as a function of λ/a in Figs. 1 and 2. For constant K there is a critical wavelength approximately proportional to $\sqrt{\mu}$, at which the flux ratio exhibits a sharp maximum, while for constant μ the flux ratio increases strongly with increase of K. A K = 25, μ = 100, and a = 2 centimeters, then λ_m = 3 meters, and the value of the flux ratio is 7.2. This effect has a possible practical application. ABSTRACT NO. 2: The theory of the magnetic aerial, consisting of a cylindrical rod of cemented magnetic powder around the centre of which is wound a few turns of wire, is investigated. This aerial is shown to be more efficient than an electric aerial in reveiving short electromagnetic waves of a few metres length. For such waves it exhibits an interesting selectivity. (a_1-5, a_2-3, b-1, c-1, d-1, e-571, f-Study)

2621. ANONYMOUS, "Radio Countermeasure Study," Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 448; 11 June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2622. ANONYMOUS, "SCEL Journal," (Application of RDF Techniques in g. m.) SC:V. N. 11; TIP1238 M-5; 24 June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2623. ANONYMOUS, "Radio Grid D/F System," Army Air Force, Watson, Project No. 1. 18; 26 June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2624. ANONYMOUS, "Remote Direction Finder," Army Air Force, Watson, Project No. 1. 16; 26 June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2625. ANONYMOUS, "SHF Direction Finder," Army Air Force, Watson, Project No. 1. 15; 26 June 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2626. ANONYMOUS, "Cathode Ray Direction Finder," Signals Research & Development Establishment (British) Report No. 1003; July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2627. ANONYMOUS, "Descriptive List of Direction Finders," Federal Telephone and Radio Corporation, Newark, New Jersey; July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2628. ADCOCK, F., AND CLARKE, C., "Location of Thunderstorms at Long Range," National Physical Laboratory (British), RRB Report; July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2629. CAFFERATA, H., "A Generalised Radiation Formula for Horizontal Rhombic Aerials, Part 3," Marconi Rev., vol. 9, pp. 102-108; July-September 1946. ABSTRACT NO. 1: A formula is developed which is believed to be more inclusive than those previously published and expresses the radiation in any given direction in a spherical coordinate system at large distances from the source. The source considered is that of a multiple array of horizontal rhombic elements arranged n in cascade, with m cascades in parallel, and all contained in the same horizontal plane. The formula takes into account arbitrary phase relations between elements and between cascades and also includes the effect of attenuation along the conductors comprising the radiating system. Parts 1 and 2 of this article (1456 and 3188 of 1946) dealt with the development of the general formula for imperfectly conducting, and perfectly conducting earth. The list of symbols used in this development was presented in part 2 immediately adjacent to the general formulas in order to make reference as easy as possible. Part 3, now presented, deals with the derivation of formulas for particular cases representing the application of the general formula to radiation in the principal vertical and horizontal planes through the origin and principal axis of the system. ABSTRACT NO. 2: The formula expresses the radiation in any given direction in a spherical co-ordinate system at a large distance from a source which is composed of n horizontal rhombic elements in cascade and m cascades in parallel, all in the same horizontal plane. Arbitrary phase relations between cascades and elements are assumed, the attenuation of the current along the length of a conductor due to reradiation is taken into account, and the effect of reflection from imperfectly conducting earth is included. The general formula is then applied to several particular cases. (a_1-3, a_2-2, b-1, c-1, d-5, e-0, f-Analysis)

2630. CLEGG, J. E., "Consol," Wireless World, vol. 52, no. 7, pp. 233-235; 7 July 1946. ABSTRACT: Principles of Consol beacon direction finding system of high accuracy originally developed by Germans under name of "Sonne," as aid to long range navigation; system comprises three component parts: ground beacon transmitting stations, aircraft radio receivers on 260 to 420 kc, and bearing tables, maps or charts, daylight range of system is 1000 mi on sea and 600 mi on land. (a-3, b-1, c-1, d-5, e-0, f-Consol principles)

2631. GOLDSTEIN, M. K., "Radio Aids to Marine Navigation," U.S. Navy. See Department of Commerce PB46556; July 1946. ABSTRACT: This paper summarizes the established navigational aids such as radio beacons, direction finding systems, and weather and time transmission, and the recently introduced navigational aids including radar, racon, loran, gee system, the consol or sonne, shoran, H/F, VHF, and UHF direction finder systems, and sonar. Brief discussions are given of contemplated and proposed aids such as the Laminar navigation and anticollision system. Decca, post office position indicator, teleran, facsimile, and infrared detection and ranging systems. Photographs, drawings, graphs and charts accompany the various systems described. This paper has been prepared for publication in the 1946 Edition of Pender's Electrical Engineers Handbook-Communications and Electronics Volume. (a-3, b-3, c-1, d-1, e-0, f-Summary)

2632. HILLAN, A. B., "Interrogation of Arthur Olschewske, Dipl. Ing., Dec., 1945," British Interrogation of German Scientists. See Department of Commerce PB39641; July 1946. ABSTRACT: The person interrogated was working on a radio method of approximate location of convoys. The method involved the interception of convoy Morse transmissions in the 20 to 50 meter band. The bearing of the transmitter was determined by means of a directional antenna and its range was determined by measuring the time interval between the "direct" signal and the round the world signal. It was found that this method was only applicable when both transmitter and receiver were in the dawn-dusk belt. Method of propagation of signals is given, and direction finding and receiver are described. (a-3, b-3, c-1, d-0, e-0, f-Description of operation)

2633. LE KASHMAN, L., "Aircraft Electronics Progress," Aero Digest, vol. 53, no. 1, p. 63; 1 July 1946. ABSTRACT: Survey of present and future application of electronics to civil aviation; no new developments are yet in evidence; continuous progress is being made in application of war-born principles of radar and radio; most promising radar developments so far have been in traffic control equipment for use at airports and along airways; loran, decca system, SCS-51 system, VHF radio range stations and ground controlled approach are mentioned. (a-3, b-2, c-1, d-1, e-0, f-Survey)

2634. MULLER-STROBEL, J., AND PATRY, J., "The Receiving Dipole Aerial," Schweiz. Arch. Angew. Wiss. Tech., vol. 12, pp. 201-213; July 1946. ABSTRACT: The integral equation for the current, due to Hallen, is solved in a general way by the method of iteration. This involves the calculation of some auxiliary functions, graphs of which are given. Some practical formulae are obtained for the current and for the field strengths and the results are exhibited graphically. The most important simplifying assumption used is that the height of the aerial is small compared with the wavelength of the incident radiation. (a-3, b-1, c-4, d-13, e-0, f-Theory)

2635. PINE, C. C., AND BUSIGNIES, H., "Discussion of a New Type of Automatic Radio Direction Finder," Proc. IRE, vol. 34, p. 457; July 1946. ABSTRACT NO. 1: The system consists of two loops fed into a switching system, a sense antenna coupled at all times to an amplifier, and another switching system from the output of the amplifier to two crossed coils for an indicating meter. ABSTRACT NO. 2: The system described by Pine is quite similar to a system described in U.S. Patent No. 1,741,282, issued to H. Busignies, which was filed on February 18, 1927, corresponding to a French application filed February 20, 1946. The system described therein makes use of two cardioid diagrams, the switching system, one receiver, one switching output system, and one magnetic indicator. In Fig. 1, which is Fig. 14 of the patent, C_1 and C_2 are the loops being fed into a switching system L_5 and L_6. A_1 is the sense antenna, which is coupled at all times to the amplifier. S, S_1 and S_2 is a rotating switch which switches the output of the amplifier into two crossed coils B_1 and B_2. In this system, B_1 and B_2 were two crossed coils of an indicating meter; however, they are equivalent to the two deflecting voltages in a cathode-ray indicator. The only slight difference is in the fact that the switching in the case of Pine's system is made on a three-step basis, while in this case it was made on a four-step basis. In the system described by Pine, the step corresponding to the sense antenna alone takes one third of the period and is applied to the two windings of the magnetic indicator simultaneously. In the system described in the patent the step corresponding to the sense antenna alone was applied to one winding of the indicator for one quarter of the period, and the other winding of the indicator for the other quarter of the period. This produces an identical effect. The switching of the sense pattern takes place during the time that the radio-frequency switch is disengaged from L_5 and L_6. Outside of this, the two systems differ only in minor details of realization of the switching system and the indicator. The system described in the patent was tested in 1926 and found to have some merits. It has never been abandoned as a good possible solution for a simple radio compass, but preference has been given to some other designs and principles which, in the meantime, have known large practical application. In answer to Busignies' discussion on my paper, "A New Type of Automatic Radio Direction Finder," I am in agreement that the system described by me is based on the same general principle as described in his U. S. patent No. 1,741,282. The main difference between the system under discussion and Busignies' system is in the method of integrating the amplified voltages. In my system use is made of electrical integrating circuits which make it possible to apply a nonfluctuating-unidirectional flux field to the indicator, while in Busignies' system the voltages are applied, successively, to the armature, and the integration is dependent upon the inertia of the armature itself. Further evidence of this feature in my system is indicated by the fact that the output voltages obtained can be utilized to operate a cathode-ray tube, which is, for all intents and purposes, an inertialess meter. In fact, experimentation has shown that a single receiver used with my system will give results comparable to a system using three separate amplifiers to drive the indicating device. It might be mentioned that a four-point commutation could be adapted to the system under discussion that would seem to have advantages over the three-point method described in my paper. (a_1-6, a_2-1, b-1, c-1, d-, e-0, f-Description)

2636. ROSINSKI, W., TOCZYLOWSKI, H. S., AND TURNER, S. G., "Notes on Development of Shipborne H/F D/F (Frequency Coverage 70 to 210 Mc/s)," Admiralty Signal Establishment (British) Report No. M.772; July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2637. SUTRO, P. J., "Characteristic Impedance of Balanced Lines," Electronics, vol. 19, p. 150; July 1946. ABSTRACT NO. 1: Three equations for the Z_0 of a balanced two-wire transmission line with cylindrical shield are compared, and expressions given for the errors in each equation. ABSTRACT NO. 2: Consider a balanced transmission line composed of two inner conductors plus a shield. The inner conductors are circular cylinders of outer radius r whose axes are separated by a distance 2s. The shield is a circular cylinder of inner radius R, symmetrically placed with respect to the two inner conductors. If, by definition, $x = r/s$ and $y = s/R$, the characteristic impedance Z_0 in ohms between the inner conductors can be expressed in terms of x, y, and the dielectric constant ϵ of the dielectric filling the line. Sommer derives an expression for the capacitance between the inner conductors of such a transmission line, following a method used by Kaden. This expression can be transformed into

$$Z_0 = \frac{120}{\sqrt{\epsilon}}\left\{\log_e\left(\frac{2}{x}\frac{1-y^2}{1+y^2}\right) - \frac{1}{4}x^2\left(1 - \frac{4y^2}{1-y^4}\right)^2 - \frac{1}{32}x^4\left[3 + \frac{32y^4(1+2y^2)}{(1-y^4)^2} - \frac{128y^4(1-2y^2-2y^6-3y^8)}{(1-y^4)^4}\right]\ldots\right\} \quad (1)$$

This is presumably correct as far as the series is carried the next term being one in x^6. When the shield is removed (that is, as R approaches infinity or as y approaches zero) the formula reduces to the series expansion of the exact expression for the characteristic impedance of the unshielded balanced line

$$Z_0 = \frac{120}{\sqrt{\epsilon}}\cosh^{-1}\left(\frac{1}{x}\right) = \frac{120}{\sqrt{\epsilon}}\left\{\log_e\left(\frac{2}{x}\right) - \frac{1}{4}x^2 - \frac{3}{32}x^4 - \frac{10}{192}x^6 - \ldots\right\} \quad (1a)$$

Thus the error in Eq. 1 always enters in the terms in x^6 and higher powers. The second formula is transformed similarly from an expression for the capacitance of the line which Sommer, in the same article, attributes to Breisig[3]. The result of this transformation can be written

$$Z_0 \approx \frac{120}{\sqrt{\epsilon}} \cosh^{-1}\left[\frac{1}{x}\,\frac{1 - y^2(1 - x^2)}{1 + y^2(1 - x^2)}\right] \quad (2)$$

This formula is a good approximation for large values of R, giving a value which is too small by an amount

$$\Delta Z_0 = \frac{120}{\sqrt{\epsilon}}\left\{\frac{x^2y^2}{(1+y^2)^2} - \frac{1}{16}x^4y^2(10 + y^2 + \dots) + \dots\right\} \quad (2a)$$

The error can be seen to go to zero when the shield is removed ($y = 0$), as is obvious from the fact that Eq. 2 then reduces to the closed form given above for the unshielded line. It is interesting to compare Eq. 1 and 2 with the formula given by Terman[4], which can be written

$$Z_0 \approx \frac{120}{\sqrt{\epsilon}}\left\{\log_e\left(\frac{2}{x}\,\frac{1-y^2}{1+y^2}\right) - \frac{1}{4}x^2(1 - 4y^4) - \frac{1}{16}x^4(1 - 4y^2)\right\} \quad (3)$$

This equation appears to neglect terms in y of higher order than y^2 and terms in x of higher order than x^4. The terms in x^2 and x^4 are incorrect, however, and the expression gives a value which is too small by

$$\Delta Z_0 = \frac{120}{\sqrt{\epsilon}}\left\{\frac{x^2y^2}{(1-y^4)^2}(1 - 4y^2 - y^3) - \frac{1}{32}x^4(1 + 8y^2 - \dots) + \dots\right\} \quad (3a)$$

Note that while the error in the x^2 term goes to zero if there is no shield ($y = 0$), the error in the x^4 term does not. Breisig's expression, Eq. 2, is more useful on the whole than Eq. 3. If y is large, the error in Breisig's equation is very nearly the same as that in Eq. 3, while for small y the error in the second equation is considerably less than that in the third. This may be of importance when x is large. In general, Eq. 1 is the most accurate. It is better than Breisig's equation everywhere except when y is very small. In most practical cases, it is sufficient to keep only the first two terms of Eq. 1, dropping the term in x^4 (which then gives the error). On the other hand, Eq. 2 is a more convenient form, and is sufficiently accurate for most purposes if x and y are not too large (x and y are always less than one). (a_1-6, a_2-1, b-2, c-1, d-1, e-0, f-Theory)

2638. WILLOUGHBY, E O, "Some Applications of Field Plotting," JIEE (London), Part III, vol. 93, pp. 275-293; July 1946. ABSTRACT: By the process of field-plotting in the cross-section of a uniform transmission line, an orthogonal field pattern of curvilinear squares satisfying the boundary conditions is obtained. If N_v is a number of voltage steps and N_f the number of electrostatic flux lines in this field plot, the characteristic impedance is given by

$$Z = 377(N_v/N_f)\sqrt{\mu}/K$$

where μ is the permeability, and K is the permittivity. Application to coupling and screening are also considered. The use of models in an electrolytic tank for capacitance determination from field plots or direct measurement is discussed, and an axially symmetrical three-dimensional field is plotted. Mention is made of the relaxation process and rubber-sheet methods of field-plotting. (a-1, b-1, c-1, d-5, e-0, f-Theory)

2639. ANONYMOUS, "Radio Direction Finding Station P.E. No. 1 Mobile (Provisional Working Instructions and Description DF Station P.E. No. 1 Mobile, in Trailer Light Amphibian 1/4 Ton)," Signals Research & Development Establishment, Provisional Pamphlet No. 612A; 3 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Instructions)

2640. ANONYMOUS, "Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 2; 5 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2641. ANONYMOUS, "Index to Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 2; 5 July 1946. ABSTRACT: This is the index to the bibliography referred to in the preceding abstract. (a-4, b-3, c-1, d-1, e-0, f-Index)

2642. DEQUERVAIN, A., "Position Finding by Means of Electromagnetic Waves," Bul Technique de la Suisse Romande, vol. 72, no. 14, pp. 177-185; 6 July 1946. ABSTRACT: Principle of radioelectric detection; accuracy of measurements; illustrated description of radar using spiral or linear sweep. Reprint from Interavia Revue de l'Aeronautique Mondiale. (a-3, b-1, c-3, d-13, e-0, f-Description)

2643. ARNETT, H. D., "The Conditions for Certainty of Interception of an Intermittent Signal by a Rotating Directional Antenna," NRL Report R-2779; 10 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2644. ROBBINS, LEN G., AND NORGORDEN, OSCAR, "Directive Antenna System in the 6 to 15 Mc Band for Essex Class Aircraft Carriers," NRL Report R-2738; 10 July 1946. ABSTRACT: This report describes a directive antenna system developed by the Naval Research Laboratory for use in conjunction with the Blanket system of communication in the 6 to 15 Mc band on Essex-class aircraft carriers. Radiation-pattern measurements conducted with this directive antenna installed on the starboard side of an Essex-class carrier (CV-39) have demonstrated that the proposed antenna system has the desired characteristics and fulfills the problem requirements. The radiation patterns indicate beam widths in the order of 50 to 60 degrees for ionosphere transmission and 65 to 80 degrees for free-space transmission; front-to-back field strength ratios greater than 3 to 1 are also indicated over the specified frequency range. The antenna system can be energized by standard Navy-type transmitters such as the Model TBK series, and offers no interference to topside fighting equipment. Subsequent inspections of the aircraft carriers CV-33 and CV-15 have shown that this proposed directive antenna can be installed on both sides of this type of vessel. This fact greatly increases the usefulness of the antenna system for the intended service. Additional radiation-pattern measurements will be necessary however to determine the optimum spacing below the flight-deck level or above water for antennas in these proposed final locations, so that satisfactory radiation patterns will be assured. For all practical purposes this directive antenna system radiates only horizontally polarized energy. This feature gives the communication circuit inherent security and anti-jam characteristics which are not possible with the usual shipboard communication antennas. In addition, this antenna has a number of other operational and electrical characteristics which are desirable for transmitting and receiving antennas, but which are lacking in most shipboard communication antennas. Therefore the antenna system described herein has definite possibilities for use as a general communication antenna in the 6 to 15 Mc band aboard ship. The antenna system requires a balancing circuit and an impedance-matching network between the transmitter and the antenna. These circuits are incorporated into a single coupling unit, and two such units, designed for installation aboard ship, have been constructed. Each coupling unit includes a balance-indicator circuit which facilitates accurate adjustment of the system for highest operating efficiency. The system also includes an antenna-selector unit which permits switching R/F power to the desired antenna system; such a unit has also been designed and constructed. (a-1, b-3, c-1, d-1, e-224, f-Description)

2645. ANONYMOUS, "Radio - Direction Finding - Model DAJa - Control System for - Problem S1280R-C - First Interim Report," USN NRL Letter Report No. C-S67/69 (1249) C-1240-219/46; 12 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2646. ANONYMOUS, "Meteor Introductory Report," Massachusetts Institute of Technology, Meteor Report No. 1; 15 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2647. HASKINS, R. L., GEORGE, S. F., AND LOVEBERG, A. G., "Preliminary Survey of Remote Control Wire Links for Model DAJ-a Direction Finder Installations with Special Reference to Distance up to 3000 Feet," USN, NRL Report No. R-2873; 15 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Survey)

2648. ROBISON, G., "Radio Direction Finder for Locating VT Fuze Jammers Radio Set AN/TRD-5," Signal Corps Engineering Laboratory, Evans, Memo No. M-1002; 15 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2649. GLEASON, R. F., AND TREXLER, J. H., "Evaluation of Model CXFF Radio Direction Finder, Submitted by Federal Telecommunications Laboratories," NRL Report R-2900; 23 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2650. ANONYMOUS, "Final Report on Project of Correlation of D.F. Errors with Ionospheric Conditions," US Bureau of Standards. See Department of Commerce Report PB L62740 and PB L62751; 31 July 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2651. ANONYMOUS, "Evaluation of Hyperbolic Radio Avigation,"

Aviation, vol. 45, no. 8, pp. 51, 149; 8 August 1946. ABSTRACT: Presentation of comparison of ranges and of geometric and timing accuracies of Loran, Gee, and Decca systems. (a-3, b-2, c-1, d-1, e-0, f-Comparative evaluation)

2652. MUSSELMAN, M. L., AND HASKINS, R. L., "Reduction of Cross Modulation at DAJ Stations by the Use of Antenna Coupling Transformers," NRL Report R-3156; August 1946. ABSTRACT: Cross modulation interference was experienced early in the operation of the DAJ direction finder stations. Tuned filters were successfully employed between the antenna and the cathode follower to eliminate the interference, but because of excessive attenuation (6-10 db) in the high frequency band they were unsatisfactory for use. Improvements in the cathode followers were inadequate and a transformer type of network was developed which was effective in eliminating the interference and also in improving the sensitivity by several db. The accuracy of the station was not impaired by the substitution of transformers for cathode followers. (a-3, b-3, c-1, d-1, e-127, f-DAJ modification)

2653. SCROGGIE, M. G., "Decca Navigator Stations," Wireless World, vol. 52, no. 8, pp. 260-262; 8 August 1946. ABSTRACT: Details are given of transmitter chain requisite to operation of Decca navigators at sea or in air; discussion covers problem of maintaining fixity of transmitted wave's pattern and means employed in Decca system for controlling phase relationships; block diagram of slave station equipment is included. (a-3, b-1, c-1, d-5, e-0, f-Description)

2654. PADGETT, E. D., "Better Direction Finders," Radio Craft, vol. 17, pp. 750, 805; August 1946. ABSTRACT: Description of the Simon radioguide, and its United States military version SCR-503-A. (a-6, b-2, c-1, d-0, e-0, f-Description)

2655. ANONYMOUS, "Radio - Direction Finding - Model DBF - F.T. & R. Corp., Contractor - Evaluation of Serial No. 2 Production Model - NRL Problem S858T-C," USN, NRL Letter Report No. R-S67/69(1245:MJS) R-1240-226/46; 6 August 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2656. MUSSELMAN, M. L., "Radio Direction Finders - Model DAJ - A Replacement of Phase Inverters (Cathode Followers) with Transformers at San Juan," USN, NRL Letter Report No. R-S67/69, R-1240-226/46; 8 August 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2657. MATLAND, C. G., AND LOOMIS, C. G., "A Preliminary Study of the Radar Homing Head for an AA Guided Missile," Massachusetts Institute of Technology, Meteor Report No. 2; 15 August 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

2658. ANONYMOUS, "Decca System of Navigation," Shipbldr & Mar Engine-Bldr, vol. 53, no. 451, pp. 456-458; September 1946. ABSTRACT: In Decca system, principles of "hyperbolic navigation," evolved during war, more especially as aid to air navigation, find expression in apparatus which is not only simple to operate, but which can be easily accommodated in relatively small space on board ship; brief and simplified account of principles involved. (a-3, b-2, c-1, d-1, e-0, f-Decca principles)

2659. ANONYMOUS, "On Non-Resonant Vee and Rhombic Aerials," J. Telecommun., vol. 57, pp. 189-198; September 1946. ABSTRACT: Expressions for the phase and amplitude of the electric field from a straight non-resonant wire, a horizontal non-resonant vee and a horizontal rhombic aerial with uniform current distribution are obtained, and it is shown how allowances are made for the effect of an imperfect earth. Specimen polar diagrams are given. (a-2, b-1, c-4, d-4, e-0, f-Theory)

2660. ANONYMOUS, "Radio News," Royal Aircraft Establishment (British), CRB Report: 46/1897; September 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2661. AFFANASIEV, K. J., "Simplifications in the Consideration of Mutual Effects between Half-Wave Dipoles in Collinear and Parallel Orientations," Proc. IRE, vol. 34, pp. 635-638; September 1946. ABSTRACT: Simple expressions for the mutual impedance which do not involve the Si and Ci functions are derived. They are in close agreement with the more exact results of Carter for aerial separations greater than one wavelength. For parallel λ^2 dipoles with spacing D the modulus of the mutual impedance is given as 60 $\lambda/\pi D\Omega$. (a-6, b-1, c-1, d-1, e-0, f-Theory)

2662. BATEMAN, R., "Elimination of Interference-Type Fading at Microwave Frequencies with Spaced Antennas," Proc. IRE, vol. 34, pp. 662-663; September 1946. ABSTRACT: Severe fading due to interference between the direct and ground reflected waves is caused by tropospheric effects which produce changes in path-length difference betweenthe direct and reflected wave. A lobe pattern is formed and fading occurs as the lobes drift past the antenna; hence there is no reception by a single antenna when it lies between two adjacent lobes. This type of fading can be overcome by spacing two vertical antennas half a lobe apart; the antenna signals are complementary. Spaced antennas may be used. The spacing between antennas would be adjusted in either a horizontal or vertical plane so as to direct a null toward the object causing multipath distortion. (a-6, b-1, c-1, d-1, e-0, f-Description)

2663. CHRISTIANSEN, W. N., "Directional Patterns of Rhombic Antennae," A.W.A. Tech. Rev., vol. 7, pp. 33-51; September 1946. ABSTRACT: Spatial directional patterns of typical rhombic antennae are given. It is shown that a design which involves the application of the simple "alignment" relation at the geometric mean of the frequency range is much superior at the higher frequencies to one in which a wider aperture has been used to obtain higher output at this mean frequency. A comparison with the pattern of a large tuned array shows the inferiority of a single rhombic antenna. Many of the prominent minor lobes seen in the directional pattern of the latter may be suppressed by the use of several rhombics in the form of an array. Various simple designs are discussed and it is shown possible, particularly when the rhombics are arranged in an interlaced "end-fire" array, to produce over the whole working range of the rhombic a directional pattern which compares well with that of a large tuned array at its designed frequency. (a-1, b-1, c-1, d-11, e-0, f-Description)

2664. LIBBY, L. L., "Special Aspects of Balanced Shielded Loops," Proc. IRE, vol. 34, pp. 641-646; September 1946. See also Elect. Comm., vol. 23, p. 332; September 1946. ABSTRACT NO. 1: The theory of operation of the balanced shielded loop aerial is reviewed. A method of analysis is described, wherein transmission-line principles are utilized to account for the distributed nature of the loop constants for loops whose perimeters are of the order of $\lambda/4$. The loop conductor within the shield may be treated as a coaxial transmission line having uniformly distributed constants, and the outer surface of the shield may be treated as a balanced two-conductor transmission line having non-uniform constants. A method is described for avoiding the relatively cumbersome equations of the latter type of transmission line by the use of an "equivalent" line having uniform characteristic impedance. A sample calculation illustrates the use of this method of analysis. ABSTRACT NO. 2: An analysis of the impedance of the screened loop aerial in terms of an equivalent uniform transmission-line section. In a numerical example concerning a circular loop of 1-foot diameter, the theoretical resonant frequency (79.4 megacycles) is found to be within 5 per cent of the measured value. (a_1-1, a_2-5, b-1, c-1, d-1, e-159, f-Theory)

2665. MOULLIN, E. B., "Radiation from Large Circular Loops," JIEE, Part III, vol. 93, pp. 345-351; September 1946. ABSTRACT NO. 1: The radiation resistance of a circular loop of any radius and its polar diagram of electric field at a large distance are calculated. According to the radius, the field can be zero in the equatorial plane or at any angle of elevation. The "high-angle" radiation can be sensibly removed by using two concentric and coplanar loops having suitably chosen radii, but with this disposition the current must be supplied to both loops and it is impracticable to induce one current from the other. The "high-angle" radiation can also be much reduced by the use of two similar coaxial large loops in parallel planes, and this offers a disposition which may be useful in practice. The power gain of a stack of N similar small loops is shown to be equal numerically to the gain of an N-member in-line array of electric doublets; and it can be shown that this is true whatever the radius of the loop, but one or more side lobes can be sensibly obliterated by suitable choice of this radius. Having regard to the difficulties of "feeding," inherent in the construction of all aerial systems, it appears that a pair of parallel large loops is one of the simplest systems for obtaining a horizontal electric field concentrated mainly in a zone of about ±30° from the equator. The choice between two such loops and a stack of small loops depends very much on the wavelength to be used. ABSTRACT NO. 2: A calculation of the radiation resistance and polar diagram of loops of any radius at a large distance. The field can, by suitable choice of radius, be made zero in

the equatorial plane or at any angle of elevation. "It is shown that the 'high-angle' radiation can be sensibly removed by using two concentric and coplanar loops having suitably chosen radii, but with this disposition the current must be supplied to both loops and it is impracticable to induce one current from the other. The 'high-angle' radiation can also be much reduced by the use of two similar coaxial large loops in parallel planes, and this offers a disposition which may be useful in practice." ABSTRACT NO. 3: The paper is an analytical study of the problem of a circular loop of any radius, which carries a simple-harmonic alternating current whose magnitude and phase are constant at all points around the circumference of the loop. An algebraic expression is derived for the radiation resistance. The power gain of N similar coaxial loops is shown to be the same as that of N similar electric doublets on a common axis. (a_1-5, a_2-5, a_3-6, b-1, c-1, d-5, e-0, f-Analysis)

2666. PROVISIONAL INTERNATIONAL CIVIL AVIATION ORGANIZATION, "Demonstrations of Radio Aids to Civil Aviation," British Commonwealth Scientific Office Report No. 75-B8-74. See also Department of Commerce PB L68087; September 1946. ABSTRACT: This volume contains short technical descriptions of items of equipment announced for showing in the United Kingdom by the Research and Development Establishment of the Ministry of Supply at the Royal Establishment and Communications Research Establishment during the program of demonstrations of radio and radar aids to civil aviation to be given on behalf of the Provisional International Civil Aviation Organization during September 1946. Drawings and photographs included. (a-3, b-3, c-1, d-5, e-0, f-Navigation aids)

2667. ROSS, W., "Report on the Interrogation of Dr. Hermann Janssen. (High Sensitivity Receiving Equipment 'Wullenwever'," British Intelligence Objectives Sub-Committee (BIOS) Interrogation Report No. 149. See also Department of Commerce PB L86689; September 1946. ABSTRACT: As "Wullenweber" has already been the subject of considerable investigations, the present interrogation was confined in the main to questions of immediate interest to the author of this report, such as the ease of setting up, balancing, and adjusting. (a-3, b-3, c-1, d-5, e-0, f-Wullenweber)

2668. WATSON-WATT, R. A., "The Evolution of Radiolocation," JIEE, Part I, vol. 93, pp. 374-382; September 1946. ABSTRACT: A general historical survey of British radar development, delivered at the Institute of Electrical Engineers Radar Convention, March, 1946. Fundamental scientific research, the British radio industry, and the needs of the Royal Air Force all vitally affected radar development; the interplay of operational and technical experience and opinion, and close collaboration between scientists and Service users might be called the real secret weapon. A few "technical milestones" briefly described were: monostatic working; first radar responder system; rotating beams; precision range- and direction-finding; airborne and shipborne radar; the plan-position indicator; common aerial for transmission and reception; the "memory tube," hyperbolic navigation; development of centimeter technique; terrain discrimination; unorthodox visibility and radar detection of clouds; and location of V-2 sites. In conclusion, tribute is paid to the radio industry's achievements under "crash programme" conditions, and some outstanding land, sea, and air uses of radar as a weapon of war are mentioned. (a-6, b-1, c-1, d-5, e-0, f-Survey)

2669. VALDIMIR, L. O., "Low Impedance Loop Antenna for Broadcast Receivers," Electronics, vol. 19, pp. 100-103; September 1946. ABSTRACT: Low-impedance loops are easier to make and are less affected by age and humidity than the corresponding high-impedance loops. An account of the design of associated transformers is given, and curves show the conditions for maximum gain. (a-6, b-2, c-1, d-1, e-0, f-Description)

2670. WOLLEY, J. C., "Investigation of the Effects of Re-Radiation on the Performance of an HF/DF Outfit in Submarines," Admiralty Signal Establishment (British) Report: Addendum A to No. M. 755; September 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

2671. ANONYMOUS, "Interrogation of Dr. Janssen of the German N.V.K. at Beltane School, Wimbledon, on 29.5.46 (Wullenwever D.F.)," British Intelligence Objectives Sub-Committee, Interrogation Report No.115; 4 September 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-See Abstract No. 2667)

2672. CHU, L. J., "The Seeker Problem of Guided Missiles," Massachusetts Institute of Technology, Meteor Report No. 3; 15 September 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2673. MC COY, R. E., "Envelope Phase Delay in Direction Finding Receivers," Signal Corps Engineering Laboratory, Evans, Technical Memo No. M-1009; 20 September 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2674. MUGRIDGE, A. H., STRUSZYNSKI, W., AND WOOLLEY, J. G., "Theoretical and Experimental Investigation of the Performance of Shipborne Fixed Crossed Loop H/F D/F Applied to Aircraft Navigation," Admiralty Signal Establishment (British) Report No. M. 780; October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-240, f-Study)

2675. RAMSAY, J. F., "Fourier Transforms in Aerial Theory: Part I," Marconi Rev., vol. 9, pp. 139-145; October and December 1946. ABSTRACT: The radiation pattern of a narrow-beam aerial can be formulated as the Fourier Transform of the aperture excitation. Examples are given of simple equiphase aperture characteristics and the evaluation of the corresponding polar diagrams. Four basic patterns are plotted, corresponding to the symmetrical, in-phase excitations known as "constant," "triangular," "cosine," and "cosine squared." (a-6, b-1, c-1, d-5, e-299, f-Theory - see later abstracts for Parts II, III, etc.)

2676. REDGMENT, P. G., STRUSZYNSKI, W., AND WOOLLEY, J. G., "Interim Report on Combined H/F V. H/F D/F Framecoil Development of the H/F D/F System," Admiralty Signal Establishment (British) Report No. M. 770; October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Report)

2677. TANNER, H. A., "K-Band Harp Material Formula Development," USN, NRL Report No. R-2979; October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2678. TANNER, H. A., AND JONES, E. L., "Manufacture of Harp Film by the Spraying Method," USN, NRL Report No. R-2987; October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2679. LUKE CHIA-LIU YUAN, "Radio Direction Finding at 1.67 Meter Wavelengths," Proc. Inst. Radio Engrs., N.Y., Wave and Electrons, vol. 34, pp. 752-756; October 1946. ABSTRACT NO. 1: Different antenna systems such as the Adcock, V-type, double-V-type, parabolic, and the H-type were tested for measuring both the vertical and the azimuthal angles of an incident wave at the wavelength of 1.67 meters. A null method using the Adcock antenna for defining the azimuthal angle and the H antenna for determining the vertical angle was found to be most satisfactory for high angles of incidence. As the frequency used is too high for sky-reflected waves, erroneous directions attributed to the effect of sky waves at longer wavelengths are eliminated. With the antenna system one and one-half wavelengths above ground and with the ground surface dry and homogeneous and no reflecting objects in the immediate vicinity, the direction of the incident wave thus determined agrees within 1/2 degree with the optical direction in the azimuthal angle and within ± 1/2 degree in the vertical angle. But when the ground is wet, the error in the vertical angle may reach as high as 3-3/4 degrees. A mathematical analysis of the reception by these two types of antenna systems, taking into consideration the ground-reflected waves, is given. The theoretical response agrees well with the experimental one. ABSTRACT NO. 2: Describes 1.67-meter tests on various aerial systems for measuring both the elevation and bearing of an incident wave. Measurements were made at ranges from 7 to 30 miles. With the aerial system 1.5 wavelengths above ground, and with a dry surface free from reflecting objects, the results agree with the optical direction for the incident wave to within 1/2 degree in bearing, and to within ± 1/2 degree in elevation. With wet ground the error in the elevation may be as great as 3-3/4 degrees. A mathematical analysis of the reception by the two aerial systems used is given. (a_1-1, a_2-5, b-1, c-1, d-1, e-0, f-Study)

2680. KANDOIAN, A. G., "Problems in Wide-Band Antenna Design," Proc. Nat. Electronics Conference (Chicago), vol. 2, p. 242; 3-5 October 1946. ABSTRACT: Summary only. The most general require-

ment is that both the impedance and radiation patterns be essentially independent of frequency over the operating range, but in some specialized applications a predetermined variation of the radiation pattern with frequency is required. Examples and measured results of various types of wide-band aerial are discussed. (a-4, b-1, c-1, d-1, e-0, f-Summary)

2681. ANONYMOUS, "Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 3; 4 October to 27 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2682. ANONYMOUS, "Index to Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 3; 4 October to 27 December 1946. ABSTRACT: Index to the Bibliography cited in preceding abstract. (a-4, b-3, c-1, d-1, e-0, f-Index)

2683. ANONYMOUS, "Flight Test of Direction Finding Equipment AN/ARQ-6," Army Air Force: AMC TSELR-60; 21 October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2684. MC COY, R. E., "Radio Set SCR-502-T4," Signal Corps Engineering Laboratory, Evans, Technical Memo No. M-1017; 30 October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2685. PEARCE, R. R., "Some Experiments on Conducting Screens for a U-Type Spaced-Aerial Radio Direction Finder in the Frequency Range 600-1200 Mc," Paper read before IEE Symposium, 30 October 1946. Electrician, vol. 137, p. 1214; November 1946. See also JIEE, vol. 94, p. 115; March 1947. ABSTRACT: An investigation was conducted to determine the minimum value of the ratio of ground screen diameter to wavelength for which polarization errors could be reduced to about 1°. It was found that a metal sheet type of ground screen should be not less than 4 wavelengths in diameter. For wire-netting screens of the same diameter, a mesh size not greater than 1/12λ was required for the same performance. ABSTRACT NO. 2: A description of a simple U-type rotatable radio direction-finder, which was used to investigate the improvement in performance of short-wave direction-finders obtained by the use of large earth screens, and to determine the smallest ratio of screen-size/wavelengths for which the polarization errors were reduced to a satisfactorily small value, ~ 1 deg. The screens were constructed of sheet metal, wire netting and radial wires, and the results showed that, provided a metal sheet was $\not<$ 4λ in dia., polarization errors as small as 1 deg could be attained. For wire-netting screens of the same diameter, a mesh size $\not>$ 1/12λ was required to attain this performance. (a_1-6, a_2-3, b-2, c-1, d-5, e-474, f-See abstract no. 2783, March 1947)

2686. ANONYMOUS, "Radio - Direction Finding - NRL Problem S1335 - AN/ARD-3 (XN-1) Airborne Radar Direction Finder," USN, NRL Letter Report No. C-S67/69 C-1240-315/46; 31 October 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2687. BOUTHILLON, L., "Principles and Applications of Electromagnetic Direction Finding," Soc. Franc. Elect. Bull., vol. 6, no. 63, pp. 563-578; November 1946. ABSTRACT: Physical principles; reflection and diffraction on objects and surface of earth and sea; theory of propagation of electromagnetic waves; technique of direction finding and military applications of radar. (a-3, b-1, c-3, d-3, e-0, f-Analysis)

2688. PONTE, M., "French Contributions to Technique of Electromagnetic Direction Finding," Bull. Soc. Franc. Elect., vol. 6, no. 63, pp. 579-588; November 1946. ABSTRACT: Development of technique since 1934; description of various test installations. (a-3, b-1, c-3, d-3, e-0, f-Survey)

2689. PRICE, W. E., AND HASSELL, E. M., "Maintenance Testing of Automatic Direction Finders," Aviation, vol. 45, no. 11, pp. 78-81; November 1946. ABSTRACT: Difficulty of attaining flight conditions in shielded room posed test and maintenance problem. The solution was found in development of antenna simulator to reproduce artificially the signal received by the directional loop. The special simulator, its associated test equipment, and the simplified technique employed are all described. (a-3, b-2, c-1, d-1, e-0, f-Description)

2690. SCROGGIE, M. G., "Air Navigation: Survey of Radio Aids to Civil Aviation," Wireless World, vol. 52, no. 11, pp. 352-356; November 1946. ABSTRACT: Various radio and radar aids are briefly discussed with particular reference to British systems; mention is made of ordinary D/F system, Decca, Consol, ORB, POPI, Eureka, Rebecca, Babs, GCA, ACR, ASMI, Condar and various other methods. (a-3, b-1, c-1, d-5, e-0, f-Survey)

2691. WALLACE, F. C., "Remotely Controlled Fixed Airfield Direction Finder," Federal Telephone and Radio Corporation, Newark, New Jersey, Internal Report No. 1; November 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2692. LUKE CHIA-LIU YUAN, "Ultra-High-Frequency Radiosonde Direction Finding," Proc. IRE, and Waves and Electrons, vol. 34, pp. 852-857; November 1946. ABSTRACT NO. 1: Description of a single direction-finder for measuring azimuth to within 1/4 degree and elevation to within 1/2 degree at 183 megacycles for a fixed transmitter; these errors are somewhat increased for a moving balloon transmitter. Measurements using Adcock and single dipole aerials are described. Various types of reflector systems for shielding a dipole aerial from ground-reflected waves were tested; the corner reflector type of shield with a simple half-wave dipole was found to be the most effective. ABSTRACT NO. 2: A simple radio D/F operating at 183 mc. for observing the flight of meteorological balloons is described. An Adcock antenna and a single dipole antenna system, including a corner reflector as a shield against ground reflected waves were used for measuring the azimuthal and the elevation angles of incoming waves. Shielding characteristics of the corner-type reflector for various wire spacings, focal lengths, and wire lengths are given. The direction finder has an accuracy of 1/4 degree in the determination of the azimuthal angle and an accuracy of 1/2 degree in determination of the elevation angle when a stationary transmitter is used. Larger errors in elevation angles were observed when the target transmitter was sent aloft in balloons. (a_1-5, a_2-6, b-1, c-1, d-1, e-0, f-Study)

2693. KING, J. L., "Interim Report - Evaluation of Countermeasures Direction Finding Equipment as Aids to Navigation - PB4Y-1 Aircraft," USN, Naval Air Station, Banana River, Project No. NAL-EL-303; 1 November 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2694. ANONYMOUS, "Radio - Direction Finding - Model CXJH - Pitmoter Log Corp., New York, New York, Contractor - Problem S1298R-C Final Report on - SSr Division," USN, NRL Letter Report No. C-S67/69(1245F) C-1240-326/46; 8 November 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2695. ANONYMOUS, "Radio Compass Bearing Error Data," Industrial Electronics Research, Incorporated, Detroit, Michigan, Report No. N-1200; 15 November 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2696. MEILANDER, M. C., "Design Factors for Modification of Model DAJ into DAJa Radio Direction Finder Equipment," USN, NRL Report No. R-2919; 19 November 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2697. BENNETT, G. M., "Radio V. U-Boat," Wireless World, vol. 52, pp. 408-411; December 1946. ABSTRACT: An account of the development of radio detection devices used by Allied aircraft and ships in the Battle of the Atlantic, and the countermeasures adopted by the enemy. (a-6, b-1, c-1, d-5, e-827, f-Survey)

2698. BOVILL, C. B., "A Review of Radio Aids in Aviation," JIEE (London), vol. 6, pp. 250-272; December 1946. ABSTRACT: An introduction to the applications of the radio art to aeronautics, with a discussion of some of the technical and practical problems involved. (a-6, b-1, c-1, d-5, e-0, f-Summary)

2699. CHRISTIANSEN, W. N., JENVEY, W. W., AND CARMAN, R. D., "Radio-Frequency Measurements on Rhombic Antennae," A.W.A. Tech. Rev. (Amal. Wireless Aust.), vol. 7, pp. 131-144; December 1946. ABSTRACT: Two instruments are described, one measuring the input impedance and the other the rf current in elevated rhombic aerials. Measurement results are given for a series of frequencies and are used to determine the position of reflecting points and the approx. power attenuation along the aerials used. (a-2, b-1,

c-1, d-11, e-0, f-Description)

2700. CLECKNER, D. C., "Equipment for Determining Aircraft Antenna Characteristics," Ohio State University, Engineering Experiment Station News, vol. 18, no. 5, pp. 7-12; December 1946. ABSTRACT: A description of the equipment and methods employed for the measurement of aircraft antenna patterns through the use of scale model airplanes. When antennas are used as a part of an instrument such as a homing device, as a radio compass, or as a command antenna, it is necessary to know in which directions the antenna will best radiate or pick up energy and to what extent the amplitude of the signal varies. (a-2, b-3, c-1, d-1, e-0, f-Description)

2701. DUERDEN, F., "The Wide-Band Dipole," Elec. Eng., vol. 18, pp. 382-384; December 1946. ABSTRACT: The approximate bandwidth of a dipole is derived from a knowledge of the radiation resistance and the characteristic impedance, the latter being calculated from the dimensions. This gives a considerably greater value than can normally be expected since the impedance of the dipole changes with frequency; this causes serious mismatches in the feeding transmission line. Curves are therefore plotted of bandwidth against dipole dimensions for various values of permissible standing-wave ratios. (a-6, b-1, c-1, d-1, e-0, f-Theory)

2702. LICHTER, S., "Army Airways Communications System Equipment (SCR-291 and AN/CRD-2)," Army Air Force, Watson: Bulletin No. 199; December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2703. MOULLIN, E. B., "Radiation from Large Circular Loops," JIEE (London) Part I, vol. 93, p. 609; December 1946. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Summary)

2704. RANGACHARI, T. S., PARANJPYE, B. H., AND DESHPANDE, G. S., "Rhombic Aerials and Matching Circuits for Reception," Electrotechnics, no. 19, pp. 19-31; December 1946. ABSTRACT: Design of rhombic antennas and optimum dimensions for various wave angles in terms of major and minor axes of rhombus; empirical rule derived for axes ratio for maximum gain; rhombic antenna designed for optimum performance between 15 and 25 m under restrictive conditions which are specified; non-inductive weatherproof terminating resister for use with rhombic antenna. (a-3, b-1, c-1, d-8, e-0, f-Fabrication)

2705. RIFE, W. E., "Simulation of the Characteristics of Direction Finder Antennas," Ohio State University, Engineering Experiment Station News, vol. 18, no. 5, pp. 12-18; December 1946. ABSTRACT: Even in aircraft direction-finder equipment of the best design, inherent errors are found in obtaining bearings. Among these are the so-called "polarization" errors, and it is because of such errors that an additional item of vital importance - the calibration data of the equipment - is needed before useful results can be obtained. Methods are described which were developed to obtain such calibration data and from them to predict the usefulness of certain proposed installations of equipment. (a-2, b-3, c-1, d-1, e-0, f-D/F errors)

2706. WRIGHT, R. W., AND JOHNSON, M. H., "Removal of Mast Reflections by Harp in the SG Installation Aboard Destroyers," USN, NRL Report No. R-3036; December 1946. ABSTRACT: A study has been made of the antenna patterns for the SG radar installation aboard a destroyer. The reflector and feed were of an improved design with side lobes approximately the same as those of the SG now under development (below 30 db). It is shown that side lobes as high as 21 db are introduced by mast reflections and that they may be eliminated by covering the illuminated section of the mast with Harp. The influence of such side lobes on the PPI presentation when large targets are nearby has also been studied and a marked improvement found with the mast reflections removed by Harp. It is concluded that the benefit derived from lower side lobes in an improved SG antenna can only be realized if provision is made to remove the mast reflections by Harp. (a-1, b-3, c-1, d-1, e-286, f-Study)

2707. GOLDSTEIN, H., "Frequency Dependence of the Properties of Sea Echo," Phys. Rev., vol. 70, pp. 938-'46; 1-15 December 1946. ABSTRACT NO. 1: Measurements were made at 9.2, 3.2 and 1.25 centimeters at grazing incidence over a wide range of sea states. The wavelength dependence of a quantity termed the "sea-echo cross section per unit area of the sea surface" was found to lie between λ° and λ^{-4}, and a modified drop theory is proposed which assumes the presence of drops whose diameter is of the order of λ. ABSTRACT NO. 2: The properties of sea echo - a radar echo associated with surface of the sea - have been measured at wavelengths of 9.2, 3.2 and 1.25 cm, for grazing angles of incidence about 1° and over a wide range of sea states, and are given in terms of a suitably defined cross-section per unit area of sea. The rapid fluctuations of the signals were eliminated by an electrical averaging scheme. The estimated uncertainty is ± 2 db on 9.2 and 3.2 cm and ± 4 db on 1.25 cm. Assuming the scatterers to be spray drops small compared with λ, the wavelength dependence of the cross-section should be between λ^{-4} and λ^{-8} whereas the observed variation is between λ^{0} and λ^{-4}. While these results are in better accord with the hypothesis of scattering from irregularities on the surface, the observed large changes of the cross-section with polarization seem explainable only by some form of the drop theory. A modification of the drop theory is proposed, which assumes the presence of drops of diameter of the order of λ. The consequences of such a theory are examined and found to be in rough agreement with experiment. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Theory)

2708. ANONYMOUS, "Radio Compass AN/ARN-6," Army Air Force, Air Transport Service Command, Technical Specifications Engineering Laboratory Report No. C7-108; 4 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2709. ANONYMOUS, "VHF/DF Radio Direction Finding Equipment," USN; 5 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2710. THRIFT, S. R., "Radio - Direction Finder - Development of Model X-DAX Report on Radio Division No. II," USN, NRL Letter Report No. S67/69 1240-309/46; 6 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2711. ANONYMOUS, "Radio Direction Finders," War Department, General Staff (Circulating Agency); 10 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2712. STRAITON, A. W., ET AL., "Horizontal Microwave Angle-of-Arrival Measurements along the Coastline near Corpus Christi, Texas," University of Texas, Electrical Engineering Research Laboratory Report No. 7; 20 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Experiment)

2713. FLATH, E. H., AND MEILANDER, W. C., "Comparison of Performance of AN/CRD-2, DAU, and FH4 Radio Direction Finders," USN, NRL Report No. R-2949; 21 December 1946. See also Department of Commerce PB123338. ABSTRACT: Comparison is made of the performance of the AN/CRD-2 an Army Signal Corp Type of radio direction finder employing an electronic goniometer with a Navy Model DAU using a mechanically rotating goniometer and a British FH4 instantaneous direction finder of the Watson-Watt type. Tests indicate that the Model DAU possessed the greatest bearing sensitivity, the FH4, the lowest instrumental error as well as the greatest effectiveness against pulsed signals with the DAU ranking second in this particular. The chief advantage of the AN/CRD-2 appears to lie in the absence of any mechanically rotating parts such as used in the DAU and of difficult maintenance alignment (such as is required with the FH4) but this apparent advantage is questionable in view of the use of balanced modulator input circuits which lack stability and requires the matching of tubes. (a-1, b-3, c-1, d-1, e-105, f-Test)

2714. FRATIANNI, S. V., "Submerged VLF Reception. Study of Various Loop Coupling Methods," USN, NRL Report No. R-2872; 30 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

2715. PINKHAM, R. A., AND KLEINBACH, W. S., "Reduction of Interference from the AN/APS-2F (ASG) Radar Equipment (with Special Reference to the SCR-269F Automatic Direction Finder)," USN, NRL Report No. R-2686; 31 December 1946. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2716. VARIOUS AUTHORS, SOME ANONYMOUS, Miscellaneous Report Titles Pertaining to Direction Finding, Acquired from German Sources after World War II, Not Dated, No Authorship Assigned, Listing Originally Compiled by University of Illinois, Department of

Electrical Engineering, about 1948. See Abstract No. 2912 (1) "Aircraft Direction Finder, Type Spez 173N." Telefunken; Air Document Index No. R2733 F782 (2) "Airborne Direction Finding Equipment with Direction Finding Receiver 173N." Telefunken; Air Document Index No. R-2298 F424. (3) "Cross-Frame Goniometer Direction Finder," Telefunken. (4) Description and Operating Instructions for Mobile Direction Finder Fu. P. E. C." Telefunken, Air Document Index No. R2296 F652. (5) "D. F. Fix Correction Instrument, Type 2134N." Telefunken. (6) "Direction Finders." Telefunken; Air Document Index No. R2765 F263. (7) "Direction Finder Type E 374N." Telefunken, Air Document Index No. R2773 F684. (8) "Direction Finder, Type P 57N." Telefunken, Air Document Index No. R2738 F642. (9) "Goniometer - Land D/F Installation with D/F Receiver E 398N." Telefunken. (10) "Goniometer Land D/F Installations." Telefunken. (11) "Ground Direction Finding Equipment FuG 4." Telefunken; Air Document Index No. R2756 F1057. (12) "Ground Radio Compass, Type 109N and 110N." Telefunken, Air Document Index No. R2740 F296. (13) "Homing Direction Finder, Type P 63 u N." Telefunken, Air Document Index No. R2294 F16. (14) "Impulse Direction Finding Equipment, Type 159N." Telefunken; Air Document Index No. R2777 F16. (15) "Installation and Operation Instructions for Radio Direction Finder Installation A 100 a1, Transportable." Telefunken. (16) "List of German D. F. Equipments Manufactured by Telefunken." Telefunken. (17) "Method of Radio Navigation." Telefunken, FIAT 753: IIIC/1098 Abst: TL/UK-2183. (18) "Naval Direction Finder Equipment." Telefunken; Air Document Index No. R3325 F361. (19) "Portable Direction-Finding Apparatus - E 383 n 2/37 EP 2a." Telefunken; Air Document Index No. R216 F848. (20) "Portable Direction Finding Equipment." Telefunken; Air Document Index No. R2862 F630. (21) "Portable, Mobile, and Stationary Direction Finders." Telefunken; Air Document Index No. R2300 F293. (22) "Preliminary Description of the Apparatus Used by a D/F Landing Team in a Two-Wheeled Trailer." Telefunken; Department of Commerce PB L70574. (23) "Radio Compass Receiver E. P. 2." Telefunken; Air Document Index No. R2733 F907. (24) "Radio Direction Finder 118 N." Telefunken; Air Document Index No. R2747 F416. (25) "Radio Direction Finding Installations 101 N and 102 N." Telefunken; Air Document Index No. R2055 F239, Department of Commerce PB54737. (26) "Radio Direction-Finding Set 130 N." (German: Telefunken) See: Department of Commerce PB L70568. ABSTRACT: This is a technical manual for the G. A. F. direction finding radio set 130 N. Abstract prepared at Headquarters Air Materiel Command, Wright Field, Dayton, Ohio. (27) "Radio Navigation of Airplanes Using the Direction-Finding Equipment 173N." Telefunken; Air Document Index No. R2297 F428. (28) "Selection of Direction-Finding Stations for Landing Purposes." Telefunken; Air Document Index No. R2060 F429. (29) "Short-range Direction Finder P 57 N." Telefunken; Air Document Index No. R2813 F1169. (30) "Direction Finding Oscillograph, Type C 170/175/183." FIAT 753: IIIC/1000, Abst.: TL/UK 1226. (31) "Discussion of the Possibilities of Construction Locator Beam Beacons and Radio Beacons as well as DF'ing Installations for Waves Which Propagate above the Ionosphere." FIAT 753: IIIC/1001, Abst.: TL/UK 1227. (32) "Report on the DF'ing of Flying Special Apparatus." FIAT 753: IIIC/1002, Abst.: TL/UK-1228. (33) "Direction Finding Over Reflecting Ground." FIAT 753: IIIC/1003, Abst.: TL/UK-1229. (34) "Principles of a DF System Based on the Use of Directional Characteristics." FIAT 753: IIIC/1005, Abst.: TL/UK-1230. (35) "Notes on a Procedure for Testing Night Effect Susceptibility of Adcock DF'ing Sets." FIAT 753: IIIC/1006, Abst.: TL/UK-1231. (36) "Rapid DF'ing Set with a Rotating Glow Tube in Connection with Goniometer Installations." FIAT 753: IIIC/1007, Abst.: TL/UK-1232. (37) "The Projected DF Installations at Bordeaux and Montpellier." FIAT 753: IIIC/1009, Abst.: TL/UK-1234. (38) "Examination of DF Loops Inside Metal Frames, Part II of the Report." FIAT 753: IIIC/1011, Abst.: TL/UK-1236. (39) "Test Report on French DF Sets." FIAT 753: IIIC/1030, Abst.: TL/UK-1237. (40) "Basic Considerations on the Switched DF Set, and Comparison with the Minimum Indicating DF Set." FIAT 753: IIIC/1031, Abst.: TL/UK-1238. (41) "Airborne Homing Receiver Klein ZE, Type C63/34." FIAT 753: IIIC/1032, Abst.: TL/UK-1239. (42) "Investigation on the Possibilities of Direction Finding with Ultra Short Waves and a Loop Antenna DF Set." FIAT 753: IIIC/1033, Abst.: TL/UK-1240. (43) "Research Report on the Work of the FFO with Y-DF Sets." FIAT 753: IIIC/1034, Abst.: TL/UK-1241. (44) "Development and Test of a New Short Wave Homing Set." FIAT 753: IIIC/1035, Abst.: TL/UK-1242. (45) "High Frequency Homing on Directional, Powerful Transmitters." FIAT 753: IIIC/1036, Abst.: TL/UK-1243. (46) "Homing Device for Pursuit Planes - Part 2." FIAT 753: IIIC/1037, Abst.: TL/UK-1244. (47) "Test Report on a French DF Set." FIAT 753: IIIC/1038, Abst.: TL/UK-1245. (48) "Tests on a Surface Direction Finder." FIAT 753: IIIC/1039, Abst.: TL/UK-1246. (49) "Homing Set with Loop DF'ing for Ultra High Frequencies." FIAT 753: IIIC/1040, Abst.: TL/UK-1248. (50) "Erroneous Indication of Goniometer DF Installations of Large Extension." FIAT 753: IIIC/1041, Abst.: TL/UK-1249. (51) "Airborne Homing Receiver Type C 109." FIAT 753: IIIC/1043, Abst.: TL/UK-1250. (52) "Direct Indication, Quick DF'ing Set Working on the Minimum Procedure, with Stroboscopic Indication by Means of an Oscilloscope." FIAT 753: IIIC/1045, Abst.: TL/UK-1252. (53) "Direct Indicating Loop DF Set with 360° Traverse." FIAT 753: IIIC/1047, Abst.: TL/UK-1253. (54) "Automatic Base DF Installation, Type C 70/32." FIAT 753: IIIC/1050, Abst.: TL/UK-1254. (55) "Double DF Receiver Type C 208." FIAT 753: IIIC/1051, Abst.: TL/UK-1255. (56) "Compensation DF Procedure for Ground Stations." FIAT 753: IIIC/1052, Abst.: TL/UK-1256. (57) "DF Angle Minimum Recorder." FIAT 753: IIIC/1053, Abst.: TL/UK-1257. (58) "Description of a DF Set for Visual Indication Working on the Principle of Energy Comparison." FIAT 753: IIIC/1054, Abst.: TL/UK-1258. (59) "Radio Sonde DF'ing with Reflector Beamed 25 Gm Waves." FIAT 753: IIIC/1056, Abst.: TL/UK-1260. (60) "A Vertical DF'ing Procedure." FIAT 753: IIIC/1057, Abst.: TL/UK-1261. (61) "On an Evaluation Procedure for Multiple DF'ing (Part I)." FIAT 753: IIIC/1058, Abst.: TL/UK-1262. (62) "Remote Control DF Installation." FIAT 753: IIIC/1059, Abst.: TL/UK-1263. (63) "Examination of DF Loops inside Enclosed Metallic Spaces." FIAT 753: IIIC/1060, Abst.: TL/UK-1264. (64) "DF Compass Type C 72 of the DVG." FIAT 753: IIIC/1061, Abst.: TL/UK-1265. (65) "On a Special Form of Interior DF Loop for Aircrafts." FIAT 753: IIIC/1062, Abst.: TL/UK-1266. (66) "Continuation of the Examination of DF Installations with Fixed Loops." FIAT 753: IIIC/1063, Abst.: TL/UK-1267. (67) "Rapid Direction Finding Recorder." FIAT 753: IIIC/1064, Abst.: TL/UK-1268. (68) "Test Concerning the DF'ing Possibility of Balloon Barrages." FIAT 753: IIIC/1065, Abst.: TL/UK-1269. (69) "Further Development of a DF Angle Oscillograph." FIAT 753: IIIC/1066, Abst.: TL/UK-1270. (70) "Concerning the Influence of DF Errors and Wind on Homing." FIAT 753: IIIC/1067, Abst.: TL/UK-1271. (71) "Investigation on a Loop Homing Airborne Set for Ultra Short Waves." FIAT 753: IIIC/1068, Abst.: TL/UK-1273. (73) "Research on a Loop Homing Set for Ultra-Short Waves." FIAT 753: IIIC/1070, Abst.: TL/UK-2180. (74) "Radio Navigation on Aircraft Equipped with Direction Finder Type Spec. 173 N." FIAT 753: IIIC/1071, Abst.: TL/UK-2181. (75) "Concerning an Evaluation Method with Multiple DF'ing (Part I)." FIAT 753: IIIC/1074, Abst.: TL/UK-2182. (76) "General Review of D. F. Systems." FIAT 753: IIIC/1093, Abst.: TL/UK-2183. (77) "Comparison of a Large Base D. F. Equipment with Rotatable, Beamed Polar Diagram with the Adcock D. F. System." FIAT 753: IIIC/1094, Abst.: TL/UK-2183. (78) "Short Wave D. F. Type R. P. 21." FIAT 753: IIIC/1095, Abst.: TL/UK-2183. (79) "Amendment to Registration of Patent for D. F. Equipment." FIAT 753: IIIC/1096, Abst.: TL/UK-2183. (80) "Description of Telefunken D. F. Equipment 103N and 104N." FIAT 753: IIIC/1097, Abst.: TL/UK-2183. (81) "Maintenance of D. F. Equipment FuGX, GV, Fu Bl. I." FIAT 753: IIIC/1099, Abst.: TL/UK-2183. (82) "Assembly of Mobile Ground D. F. Equipment A 80 C." FIAT 753: IIIC/1100, Abst.: TL/UK-2183. (83) "Direct Reading D. F. Equipment with Rotatory Goniometer Spool." FIAT 753: IIIC/1102, Abst.: TL/UK-2183. (84) "Direct Reading D. F. Equipment with Periodically Inclosed Frame." FIAT 753: IIIC/1103, Abst.: TL/UK-2183. (85) "Circuit Plan for Direct Reading D. F. System." FIAT 753: IIIC/1104, Abst.: TL/UK-2183. (86) "Self Deciphering D. F. System." FIAT 753: IIIC/1105, Abst.: TL/UK-2183. (87) "Automatic Energy Regulation in D. F. System." FIAT 753: IIIC/1106, Abst.: TL/UK-2183. (88) "Automatic Limitation of Output Capacity in Receivers." FIAT 753: IIIC/1107, Abst.: TL/UK-2183. (89) "Automatic Transmission of Indicator Positions by Using Small Electrical Transmission Energies and the Achievement of Large Reception Energies at the Place of Reception." FIAT 753: IIIC/1108, Abst.: TL/UK-2183. (90) "Automatic Transmission of Indicator Positions." FIAT 753: IIIC/1109, Abst.: TL/UK-2183. (91) "Direct Indicating D. F. System for A/C's Allowing Certain Deviations from the Set Course." FIAT 753: IIIC/1110, Abst.: TL/UK-2183. (92) "On the Accuracy of DF'ing FIAT 753: IIIC/1111, Abst.: TL/UK-2183. (93) "Examination of DF Loops inside Metallic Airplanes." FIAT 753: IIIC/2000, Abst.: TL/UK-1274. (94) "Magnetic Compass, Suitable as Automatic Course Indicator." FIAT 753: IIIC/2053, Abst.: TL/UK-2183. (95) "Report on Tests Carried out on Receiver E. 26." FIAT 753: IIIC/2054, Abst.: TL/UK-2183. (96) "Report Tests Carried Outon Tn-Rn FuNG 101." FIAT 753: IIIC/2056, Abst.: TL/UK-2183. (97) "DF'ing with 3 cm Waves." FIAT 753: IIIC/3026, Abst.: TL/UK-1317. (98) "Long Wave DF Set Free from Polarization Errors (Long Wave Adcock DF'er)." FIAT 753: IIIC/3035, Abst.: TL/UK-1321. (99) "Handbook for the Fixed Radio DF Installation Fu Peil-A 70-b." FIAT 753: IIIC/3045, Abst.: TL/UK-1330. (100) "Auxiliary for A-N-DF'ing with Symmetrical Antenna Groups." FIAT 753 IIIC/3119, Abst.: TL/UK-1355. (101) "The Accuracy of Navigation." FIAT 753: IIIC/3124, Abst.: TL/UK-1360. (102) "On the Influence of Errors in Direction Finding and Wind on a Homing Flight." FIAT 753: IIIC/3134, Abst.: TL/UK-2186. (103) "Measurements of the Wind at High Altitudes by Direction Finding on a Balloon." FIAT 753: IIIC/3139, Abst.: TL/UK-2189. (104) "Description of Radio Landing Receiver Fu Bl. L." FIAT 753: IIIC/3151, Abst.: TL/UK-2183. (105) "Servicing of Navigation Set FuG 125." FIAT 753: IIIC/3152, Abst.: TL/UK-2183. (106) "Auxiliary Part of Direction Finder to Correct Error of Compass Indicator." Air Document Index No. R3371 F1143. (107) "Azimuth Determination with the D/F Installation Peil Ia." Air Document Index No. R 210 F290. (108) "The Calculation of

Directional Characteristics of Compensated Antenna Groups and Their Use for Azimuth and Elevation Determination." Air Document Index No. R2212 F705. (109) "Concerning the Polarization Error in DF'ing." FIAT 753: IID/112, Abst.: TL/UK-846. (110) "Description and Operational Manual on the Airborne Direction-Finding Sets Peil Ia and 2a." Air Document Index No. R212 F781. (111) "Description of the Radar Search Receiver Fu MB9." O.K.M. (112) "Direction Finding and Position Finding." Air Document Index No. R 2050 F645. (113) "The Effect of Neighboring Metal Parts on Receiving Loops with Consideration of the Installation of DF Loops on Airplanes." FIAT 753: IID/163, Abst.: TL/UK-891. (114) "Errors in Adcock DF'ing." FIAT 753: IID/1002, Abst.: TL/UK-908. (115) "FuG 120a." Air Document Index No. R216 F388. (116) "FuG 120a Directional Radio." Messerschmitt: Air Document Index No. R2045 F88. (117) "FuG VII Air to Air Radio Telephone Installed in Ju 87, Dive Bomber, or Bf 109, Fighter, Used for Short Wave Direction Finding." G. L. Z.: Air Document Index No. R2662 F301. (118) "Great-Circle Deviations by Ionospheric Reflections." FIAT 677; Report 48. (119) "Index of the Technical Reports on Scientific Problems Undertaken by the Institute (B.H.F.)." B.H.F.: FIAT 753: IC/242, Abst.: TL/UK-1826 (120) "List of Scientific Reports." FIAT 753: IC/305, Abst.: TL/UK-1884. (121) "List of Scientific Reports." FIAT 753: IC/304, Abst.: TL/UK-1883. (122) "List of Published Reports." FIAT 753: IC/2, Abst.: TL/UK-1748. (123) HOERSCHELMANN, H. VON, "Mathematical Theory of the Radio Compass Which Uses Refracted Wave Fronts Resulting from Earth Conductivity." Air Document Index No. R2743 F300. (124) "Pictures of Ground Radio Direction Finder Kornax." Air Document Index No. R4007 F122-130. (125) KINDER, "Position Determination of Radiosonde Sets in Flight by Use of 25 cm D/F." FIAT 677: Rpt. 56. (126) "Preliminary Description and Maintenance Instructions for the FuG 241." Air Document Index No. R2297 F603. (127) "Preliminary Description of the Airborne Radio Direction Finding Apparatus Peil 1 and Peil 2." G.L.Z.: Air Document Index No. R213 F851. See also Department of Commerce PB L62301. (a-4, b-3, c-3 and 4, d-3 and 4, e-0, f-Various reports)

2717. VARIOUS AUTHORS, SOME ANONYMOUS, "Miscellaneous Report Titles Pertaining to Direction Finding, Not Dated; Originally Compiled by the University of Illinois, Department of Electrical Engineering about 1946; British and United States Departmental Sources." (See Abstract No. 2912): (1) "100-160 Mc Experimental Direction Finding Antenna for Use with Model CXGG-2 Radio Direction Finder Equipment." Federal Telecommunications Laboratories, Nutley, New Jersey, Report No. TM 176. (2) "Comparative Intercept Suitability of Model DBM-1 Radar Direction Finder and Search Antennas AT-37/APT and AS-26/APR-2." USN NRL: R-2986. (3) "Final Report on Trials Carried Out in the Universal Homer 'Hookah' Installed in Mosquito XXX NT556." Great Britian Bomber Support Development Unit, Report No. 44 (JEIA: 10348). (4) "Instantaneous Cathode Ray Indicators for Use in Connection with Direction Finders. (Principles also Applicable to Radar PPI Systems)." Federal Telecommunications Laboratories, Nutley, New Jersey, Report No. 48. (5) "Instruction Book for CXKH Radio Direction Finder Equipment." Federal Telecommunications Laboratories, Nutley, New Jersey. (6) "Interim Development Report on Improvement of Sense Operation Model DAQ." Federal Telecommunications Laboratories, Nutley, New Jersey, Report TM 99, 99a, and 99b. (7) CLARK, T. H., "Investigation of Errors in Spaced Collector Direction Finder Systems." Federal Telecommunications Laboratories, Report No. TM 37. (8) "List of British Reports on Direction Finding," B.C.S.O: Nos. 1-8. (9) "Model CXHT Aircraft Direction Finder (28-100 Mc)." Federal Telecommunications Laboratories, Nutley, New Jersey, Report No. TM 158. (10) "Operating Instructions for Type E-2 Indicator When Used with DBF D/F." Federal Telecommunications Laboratories, Nutley, New Jersey. (11) "Proposed Program for Modernization of DAJ Direction Finder Stations." Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 282. (12) "Radio Direction Finder for Marine Corps Reconnaissance 1.5 to 160 Mc." Federal Telecommunications Laboratories, Nutley, New Jersey, Proposal No. 207. (13) "Scanning and Direction Finding Receiver for Shipboard Service - Type CXGH." Federal Telecommunications Laboratories, Nutley, New Jersey. (14) "Status Report on Model X-DBO Antenna Development." Federal Telecommunications Laboratories, Report No. TM 172. (15) "Tests of Automatic Direction Finder Type MN-31, in PV-1 Aircraft." USN Naval Air Station, Banana River, TED BAK 3144-10. (16) BRAY, W. J., AND OWEN, F. C., "The Electrical Characteristics, Line-Up Procedure, and Performance of Short Wave D.F. Stations for Admiralty Use, and the Design of a 1-5 Mc/s Goniometer." General Post Office (British) Report No. 1046 (CRB: 44/1190). (17) ASHMEAD, J., AND ELLIOTT, W. S., "The Possible Application of C.R.D.F. Technique to G.L. on a Wavelength of 10 Centimeters." R.R.D.E. Report No. 104. (18) "VLF Automatic Radio Compass 100 - 160 Mc/s." Federal Telecommunications Laboratories Proposal No. 314. (19) "The Simon Radioguide." Radio Navigational Instrument Corp., New York, New York. (20) "Instruction Bulletin - Opposed Spaced Loop Direction Finder." Automatic Electric Company, Chicago, Ill. (21) "Instruction Book for Model DU-1 Aircraft Radio Direction Finding Equipment." Bendix Aviation Corporation, Baltimore, Maryland, Report No. IB 348. (22) "Dane Marine Direction Finder (GC Radio Compass)." Dane General Communications Company (USN BuShips 925D: X-44.10-217). (23) "SCP 599 New Four Band Automatic Radio Compass." Fairchild Aviation Company. (24) "Descriptive Literature on Wolff Airpilot." Precision Laboratories; Irvington, New Jersey, BuShips 925D: X-44.14-231. (a-4, b-3, c-1, d-5, e-0, f-Various reports)

2718. ANONYMOUS, "Description and Servicing Instructions of Indicator 'Uranyl I'," (German: Telefunken) See: Department of Commerce PB L67789. No date. ABSTRACT: This document contains a description and servicing instructions of the indicator "Uranyl I" used in connection with a supersonic direction finder. The indicating device is a cathode-ray tube with two screens situated one above the other, the upper screen being the conventional screen, the lower a long persistence screen. Drawings, diagrams, and photographs included. (a-3, b-3, c-4, d-4, e-0, f-Instructions)

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2719 CHRISTIANSEN, W. N., "Rhombic Antenna Arrays," A.W.A. Tech. Rev., Amal. Wireless Aust., vol. 7, no. 4, pp. 361-383; 1947. ABSTRACT: The power gain of a rhombic aerial may be calculated if the average amplitude of the current flowing along the conductors is determined experimentally. Results of measurements on a rhombic aerial are given, and the gain is shown to be much inferior to that of a large array of tuned elements. Arrays of rhombic aerials designed to have smaller unwanted lobes of radiation and greater radiation efficiency than a single aerial, are described and the power gain calculated from current amplitude measurements. Four-element arrays of rhombic aerials are shown to have a performance, in a 2:1 range of frequency, comparable with that of large arrays of tuned elements. (a-2, b-1, c-1, d-11, e-0, f-Descriptive theory)

2720 EPSTEIN, P. S., "Radio Wave Propagation and Electromagnetic Surface Waves," Proc. Nat Acad. Sci., vol. 33, no. 6, pp. 195-199; 1947. ABSTRACT: The propagation of radio waves along the surface of the earth was first investigated by Sommerfeld who found that the Hertzian vector of an em field comprises space waves and a surface wave. Later H. Weyl obtained a solution which contained only the space waves and Sommerfeld agreed that the surface wave did not exist in this case. The author demonstrates that both results are mathematically correct but represent two different physical phenomena. He shows that Sommerfeld analysis allows also a second solution which does not contain the surface wave but that the difference between the two possible solutions can serve as the basis of a third solution which represents a surface wave independent of the dipole radiation and not generated by the dipole. (a-4, b-1, c-1, d-1, e-0, f-Theory)

2721. HAUSZ, G., "Guide-Beam Control Technique for V-2 Rockets," Tele-Tech., vol. 6, p. 76; 1947. ABSTRACT: Means used to minimize deviations from vertical plane through target and launching point, so as to guide missile in straight line; basic principles and details of radio equipment permitting accuracy within tens of yards at 100 mile range. (a-3, b-2, c-1, d-1, e-0, f-Description)

2722. KEEN, R., Wireless Direction Finding, Fourth Edition, Iliffe and Sons, Ltd., London, England; 1947. ABSTRACT NO. 1: This basic reference on radio direction finding contains an extensive bibliography of material published before 1947. ABSTRACT NO. 2: The book with its valuable bibliography, now containing over 400 references, can be strongly recommended to all students, engineers and operators who are concerned with the practice of this subject. Radar technique is excluded, but a new chapter describes some modern navigation systems, including gee, loran, decca and consol, and the chapter on beacon systems is considerably enlarged. ABSTRACT NO. 3: Navigation systems using hyperbolic grid, design and testing of HF radiogoniometers, and transmission line theory as applied to Adcock aerial systems discussed; cause and reduction of resonance effects in Adcock aerials and feeders and HF finding equipment considered; radar is not included in this manual. Bibliography. ABSTRACT NO. 4: The appearance of the fourth edition of this book will do much to dispel the impression, prevalent in some quarters, that the technique of radio direction finding has been rendered obsolete by the introduction and development of radar in recent years. As the author explains in his introductory chapter, there are several fields in which direction finding will still have commitments for many years to come. The relative simplicity of the equipment required to give guidance to ships and aircraft, and particularly to those in distress, makes it an invaluable aid to navigation; in another field, the network of direction finders provides

the only means so far available of locating radio transmitting stations, and such information is frequently required under peace-time conditions as well as in time of war. In spite of the fact that the present book excludes a discussion of radar technique as such, it is a considerable enlargement on the previous edition, which was reprinted four times during the War. The only new chapter added describes the recently developed radio navigation systems such as 'Gee', 'Loran', 'Decca', and 'Consol', some of which use pulse modulation and some continuous-wave technique. The remaining chapters have been suitably expanded to include material descriptive of advances and developments; much of this material has only recently become available for publication. Two of the most important additions are the sections on the calibration of direction-finding systems of various types, and on the classification of observed bearings. On both these subjects there has been much confused thinking in the past, and their detailed study has resulted in considerable improvement in the accuracy with which radio bearings can be observed and interpreted. The subject of radio wave propagation at both high and very high frequencies is treated somewhat more fully, since a detailed knowledge of this is fundamental to the successful exploitation of direction finding. The book has been brought up to date also by the addition of details of new equipment developed both in Great Britain and in the United States, and including blind approach and landing systems for aircraft, improved forms of the Adcock and spaced-loop aerial systems, and various types of cathode-ray tube presentation devices. The bibliography is, as in previous editions, an important feature of this book. With more than four hundred references, it forms a very useful guide to the literature of the subject, and it includes the titles of some papers still in course of publication. As a comprehensive, practical manual on the various aspects of radio direction finding, the book can still be confidently recommended to students, engineers and other workers in this field. (a_1-4, a_2-6, a_3-3, a_4-2, b-6, c-1, d-5, e-0, f-Reference book; see Abstract No. 1029 for 3rd edition)

2723. MORISON, SAMUEL ELIOT, The Battle of the Atlantic, September 1939-May 1943, History of United States Naval Operations in World War II, Volume I, Little, Brown and Company, Boston, 1947. ABSTRACT: Important references to HF/DF are given on pages 105, 226-228. For instance, on page 105, "The principal information received by both Navies about the movements and whereabouts of enemy submarines came from shore-based high-frequency direction-finders (HF/DF), whose bearings were plotted at Washington and London and sent out on Fox in a secret daily bulletin giving estimated positions and directions of advance. While these fixes were seldom accurate within 50 or 100 miles, if obtained in time they enabled an escort commander to order an evasive change of course, which had a fair chance of avoiding a wolf-pack. By Admiral Doenitz's admission these diversions from the course laid down before the convoy sailed frequently frustrated his wolf-packs. But sometimes the machinery became stalled. Many instances occurred in which the daily report of U-boat positions that threatened the safety of a convoy reached the escort commander after dark, when it was impossible to plan and execute an evasive change of course except by blinker, the use of which was forbidden at night. Nor were these conditions much better before the fall of 1942." Again on pages 226-228, a description of the HF/DF and its importance to anti-submarine warfare is described as follows. "A convoy is no better than its ears and eyes. Radar furnished the convoys with a cat's eyes, sonar with its ears, while the high-frequency direction-finders (HF/DF, pronounced "Huff-Duff"), picking up from land or ship the radio transmissions of U-boats at sea, acted as a highly sensitive and elongated cat's whiskers. The Royal Navy was the first to adopt this method in its fight against submarines. The principle was simple enough. In place of the single loop-finder that fishermen and other vessels use to get cross-bearings on radio beams from known shore stations, you planted direction-finders along the coast in order to get cross-bearings on a submarine commander who was talking to another submarine or reporting to Admiral Doenitz. It did not matter that one could not tell what he was saying; the mere fact that he was transmitting served to fix his position. These bearings were sent in from the shore stations to the Admiralty, where specially trained men and women were able to plot the course of a submarine across the Atlantic. The Canadians developed a device whereby the bearings were recorded semiautomatically. As a further improvement the United States Navy developed a machine which plotted the bearings geometrically. Sometimes as many as thirty bearings would be had on one submarine's transmission. But the HF/DF stations in England and Africa provided better fixes than those in Canada and the United States, because the American coastline is roughly parallel to the transatlantic convoy route that the U-boats traveled as well. There is no better example of the effectiveness of the land-based high-frequency direction-finder than that of the submarine kill by Lieutenant Schreder's plane. About noon on 30 June 1942, high-frequency direction-finder ranges were obtained by the stations at Bermuda, Hartlant Point, Kingston and Georgetown. Operations officers at N. O. B. Bermuda plotted the bearings, which made a perfect fix, showing the submarine to be at lat. 33°N. long. 67°30'W, about 130 miles WSW of St. Georges. Lieutenant Richard E. Schreder USNR in a Mariners of Squadron VP-74, on patrol out of Bermuda, was about fifty miles away. Immediately notified, he laid his course accordingly and found U-158 within ten miles of the predicted position, idling on the surface with about fifteen men sunning themselves on deck. He dropped two demolition bombs which missed one depth charge which near-missed, and one which stuck to the superstructure and detonated as the submarine went down. It never came up, and there were no survivors. Although the shore HF/DF stations were of inestimable value in locating submarines in time to devert the routing of convoys, or to warn them of the enemy's presence, the necessary delay in receiving their reports made it highly desirable to install HF/DF on escorts. In the summer of 1942, the Navy obtained three British shipborne sets from the Admiralty which were turned over to the Naval Research Laboratory, where a civilian scientist, Dr. Harry Goldstein, was largely responsible for the development of an American version. Captain P. R. Heineman, long an advocate of HF/DF, was practicularly interested in the operational development. As early as June 1942, when escort commander of Convoy ONS-102, he made it the subject of a special report. Having seen it demonstrated by Canadian ships in his group, he wrote that "two of the HF/DF bearings reported by the Restigouche led to the sighting of two and possibly three submarines on the surface on 16 June." About 1 October 1942 the first sets were installed in the Coast Guard Cutters Spencer and Campbell which Captain Heineman alternately rode as escort commander. If only one ship in a convoy had HF/DF, she was made the rescue ship and sailed in the last place of the middle column. It was much better, however, to equip several ships with it in each convoy they disposed, so as to obtain cross-bearings on near-by submarines making transmissions. The Germans long ignored the danger of shipborne HF/DF; their U-boats continued to chatter among themselves and to Doenitz when closing on a convoy, which revealed their position to the screen." (a-1, b-6, c-1, d-1, e-0, f-Material quoted with permission of the publisher)

2724. ALFORD, A., BARKOFSKY, E. C., K AUS, J. D., CLARK, H. K., STAVIS, G., MCGUIGAN, W., AND CHRISTENSEN, J. W., "Very High-Frequency Techniques," vol. 1, McGraw-Hill Book Company, Inc., New York. 1947. ABSTRACT: Book with 4 chapters on Direction Finding as follows: Chapter 9. Principles of Direction Finding; The General Direction-finder Problem - Wave Polarization and Cross Field - Direction-finder Requirements above 50 Mc - Basic Direction-finder Methods -Reflections: Case 1; Case 2 - Directivity - Vertically Polarized Collector in Horizontally Polarized Primary Field - Effect of Reflections on Antenna Pattern - Time-difference Method - Other Methods - Indicators. Chapter 10. Antennas for Direction Finders: General Considerations - Beam Width - Antennas of Dimensions Small in Comparison with a Wavelength - Antennas about 1/2-Wavelength Long - Antennas with Dimensions of Several Wavelengths - Beam Width vs. Aperture - Aperture - Effective Aperture - Collecting Aperture - Physical Aperture - Relation between Aperture - Power Gain - Directivity Ratio - Effect of Polarization on Aperture - Example of the Relation of the Apertures - Effect of Transmission Line on Effective Aperture - Band Width - Polarization Discrimination and Response Ratios - Bearing Deviation - Application of Direction-finder Antennas - Half-wave Element and Adcock Array - Double-loop Spinner: Combination Vertical-horizontal Corner-reflector Spinner - Combination Vertical-horizontal Parabolic-reflector Spinner - Spinner Auxiliaries - Circularly Polarized Horn with Parabolic Spinner - Fixed Antennas - Rotation-speed Considerations - Testing Techniques. Chapter 11. Indicators for Direction Finders; The Problem - Remote Indication - Need for Automatic Direction Finding - Rotating-disk Indicator - Pulse Indicators - Magnetic-coil Method - Envelope Tracers - Magnetic Scan - Electrostatic Pulse Indicator - Capacitor Scan - Electrostatic Indicator - Sine-potentiometer Scan - Electrostatic Indicator - Electronic Scan - Radial Presentation - Electrostatic Indicator - Synchro Scan - Double-line Indicator - Comparison of Presentations - Reference Bearing - Instrument Errors. Chapter 12. Homing Systems; Introduction to Homing Antennas for Very-high-frequency Homing - Pattern Measurement - Classification of Antenna Systems - Antenna Systems for Azimuth Homing - Antennas for Elevation Homing - Commutators - Indicators - Miscellaneous Considerations. A-v-c Circuits - Performance. (a-1, b-6, c-1, d-1, e-0, f-Book)

2725. BOULET, J. L. L., "Investigation of Doppler Effect in Determining Direction of Arrival of Radio Waves," University of Illinois, Thesis, Master of Science; 1947. ABSTRACT: The problem of direction-finding is to develop an equipment giving the correct bearings of an incoming wave. In the present paper, a mathematical analysis of the possibilities of using the Doppler effect, directly and indirectly, is carried out according to the plan given below. (a) A study is made of the frequency deviation when antennas are moving with a certain velocity in an electromagnetic field, the velocity vector of the antenna making an angle with the direction of propagation of the wave. Both translational and rotational motions are considered. (b) The frequency deviation possible when using a linear or circular array of

fixed antennas is calculated, each antenna being connected in turn to a receiver by means of a commutating device. A law expressing the coupling between each antenna and the receiver, as a function of time or angular position of the commutating device, is developed. Before going into the description of some of the possible systems using Doppler effect, a few words on the Doppler effect itself will be given. (a-1, b-3, c-1, d-1, e-968, f-Thesis study)

2726. SMITH, R. A., "Radio Aids to Navigation," University Press, Cambridge, England; 1947. ABSTRACT: Contains a few brief comments of D/F performance in general in the low, medium, and high frequency ranges. There are some comments on siting also. Book contains 112 pages. (a-4, b-6, c-1, d-5, e-0, f-Monograph)

2727. ANONYMOUS, "Evaluation of Model CXGH-2 Radio Direction Finder Equipment," USN, NRL Report No. R-3038; 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

2728. CLARKE, C., "Atmospherics and Their Location," JIEE (London) Part I, vol. 94, pp. 54-55; January 1947. ABSTRACT: The nature of the discharge process associated with a lightning flash is briefly considered. A direction-finder used for locating lightning flashes must have a selective-tuned receiver for an operating band of about 10 to 30 kilocycles, a linear output for a wide range of input voltages, and a higher over-all gain than would be necessary for cathode-wave signals for similar field strength. A cathode-ray tube with a persistent screen must be used. Brilliance modulation has marked advantages. Atmospherics are located by simultaneous observation of their direction of arrival at two well-separated stations. The main source of inaccuracy is polarization error. Summary of an Institution to Electrical Engineers. Students' section paper. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

2729. GRIFFITH, R. M., ET AL., "Development of a Shipborne H. Adcock V. H/F D/F (70-210 Mc/s), Admiralty Signal Establishment (British) Report No. M.793; January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Summary)

2730. HORNBERG, K. O., "Evaluation of the VHF Band of a 140-600 Mc Experimental Radio Direction Finder Developed by the Federal Telephone and Radio Co. under Contract OEMsr-961," NRL Report R-2998; January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

2731. MOON, J. H., "The Design of Electromagnetic Radiogoniometers for Use in Medium-Frequency Direction-Finding," JIEE, (London), Part III, vol. 94, pp. 69-77; January 1947. ABSTRACT NO. 1: An investigation into the causes of errors and an account of modifications designed to reduce them. The more important results obtained with a new and improved design are tabulated; this design is shown to be 6 decibels better in signal-to-noise ratio than any existing design and has a maximum instrumental error of less than ± 1/2 degree. ABSTRACT NO. 2: A special study has been made with the object of analyzing the causes of goniometer errors and of introducing modifications. Several methods of measuring instrumental errors are described. (a_1-2, a_2-6, b-1, c-1, d-5, e-433, f-Goniometer)

2732. MARSHALL, JR., S. W., "Investigations, Studies and Analyses of Pilotless Aircraft Mid Course Guidance and Control Systems," USN, BuShips-BuAir: 1; 1 January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

2733. ANONYMOUS, "Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 4; 3 January-28 March 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2734. STRAITON, A. W., "Vertical Phase Front Measurements for Microwave Transmissions over Water near Corpus Christi, Texas," University of Texas, Electrical Engineering Research Laboratory, Austin, Texas, Memo No. 4; 6 January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2735. BEWIG, K. W., "3800-5000 McHorn Antenna for Calibration of DBM-1 Equipment," USN, NRL Report No. R-3049; 14 January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2736. SHEETS, M. J., "Evaluation of Model OCQ Re-Radiation Frequency Meter," USN, NRL Report No. R-3048; 14 January 1947. ABSTRACT: The Model OCQ Re-radiation Frequency Meter is designed for use as a test instrument by the personnel responsible for the installation, calibration and maintenance of operation of high frequency direction finders (1.5 - 22 megacycles) on board ships. Investigation and analysis of the mechanical and electrical performance and constructional features were made, and the overall sensitivity was compared with that of an equivalent British instrument. The overall performance of this instrument is not considered satisfactory. The output of the exciter unit is low and unstable in Band 4 and is low in Band 1 with respect to the other bands. Spurious responses were found, a serious one occurring near the high end of Band 1. The exciter deficiencies require remedying and the spurious responses should be reduced before the instrument could be considered satisfactory for Naval use. (a-1, b-3, c-1, d-1, e-249, f-Evaluation report)

2737. ANONYMOUS, "Radio - Direction Finders - Remote Control of - Problem S1280, S1282, and S1283 - Third Interim Report on," USN, NRL Letter Report No. C-S67/69(1249) C-1240-14/47; 15 January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2738. HORNBERG, K. O., "Evaluation of the VHF Band of a 140 - 600 Mc. Experimental Radio Direction Finder Developed by Federal Telephone Laboratory under Contract OEMsr-961," USN, NRL Report No. R-2998; 15 January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

2739. KILPATRICK, E. L., "Report on Test Operation of Canadian Type HF/DF Equipment Installed at HF/DF Station, Coast Guard Unit #5," USN, Coast Guard Report; 22 January 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2740. TROUNSON, E. P., AND RAFF, S. J., "Electrical Nature of Salt Solutions (Part IV) (The Attenuation of Plane Electromagnetic Waves in Sea Water) (NOL-18)," Source: Navy Ordnance Laboratory Memo No. 8936; 23 January 1947. ABSTRACT: This paper is a collection of data on the attenuation of plane electromagnetic waves in sea water from 10 cycles per second to the ultra violet. Some comments and references, on methods of measurement and accuracy expected, are included. Brief references are made to various pertinent theories. (a-1, b-3, c-1, d-1, e-261, f-Experimentation report)

2741. ROSS, W., AND BRAMLEY, E. N., "Lateral Deviation of Radio Waves at Sunrise," Nature (London), vol. 159, p. 132; 25 January 1947. ABSTRACT NO. 1: An account of observations made at Slough on the 6.05-megacycle, British Broadcasting Corporation transmitter in Cumberland during April and May, 1946; the sunrise line being then approximately along the transmission path. "The bearings immediately following the maximum usable frequency condition were usually some 10 or 20 degrees to the east of the true direction, which was afterwards gradually approached," Calculations of bearing deviation based on changes with time of the equivalent height of reflection agreed with the directional observations. ABSTRACT NO. 2: Results of observations on 6.05 Mc/s over a distance of 400 miles. A receiver bearing of 10 to 20° to the east of the time direction was observed immediately following the establishment of the maximum usable frequency condition, the true direction being approached in a time varying on different days from a few minutes to an hour. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Experimental analysis)

2742. ANONYMOUS, "Remote UHF Direction Finder," Federal Telephone and Radio Corporation, Newark, New Jersey, Proposal No. 469; February 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

2743. TETELBAUM, S. I., "Basic Equations in Radiolocation," Radiotekhnika (Moscow), vol. 2, pp. 24-34; February 1947. ABSTRACT: In Russian with English summary. Relations are derived between the transmitted power, receiver sensitivity and the maximum range for nonradiating objects. (a-6, b-1, c-2, d-2, e-0, f-Theory)

2744. HAMLIN, E. W., GORDON, W. E., AND LAGRONE, A. H., "X-Band Phase Front Measurements in Arizona During April 1946," University of Texas, Electrical Engineering Research Laboratory, Austin, Texas, Report No. 6; 1 February 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Experiment)

2745. KESSLER, W. J., "A Study of Atmospheric Direction Finding," Florida Engineering and Industrial Experiment Station, University of Florida, Gainesville, Florida, Report No. 5411; 2 February 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

2746. RICE, S. M., "Technical Evaluation of Model AN/APA-48 Airborne Radio Direction Finder," USN, NRL Report No. R-3055; 3 February 1947. See also Department of Commerce PB133000. ABSTRACT: The Radiomarine Corporation of America production model of the AN/APA-48 Airborne Radio Direction Finder equipment, designed for homing on radar signals in the frequency range from 125 to 190 megacycles and for use on the F6F aircraft, was evaluated to determine its compliance with the contract specifications. (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

2747. ANONYMOUS, "Loop Assembly AS-313/ARN-6," Army Air Force, Wright Field, Ohio, Report: TSELC7-130; 10 February 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2748. BUSIGNIES, H., AND DISHAL, M., "Relations between Bandwidth, Signal-to-Noise Ratio and Speed of Indication in Radio Navigation and Direction Finding," Federal Telecommunications Laboratories, Inc., Nutley, New Jersey; 24 February 1947. ABSTRACT: The fact that there is a fundamental relationship between "required minimum pass band width" and "rate of transmitted intelligence" is well known in the communication field. Also, well known is the basic relationship between the thermal agitation noise power and the pass band width, and in a more qualitative way, the relationship between the pass band width and effect of impulse type noise upon a received signal is also understood. It is the purpose of this paper to consider the implications of the above relationships with reference to the specific field of radio direction finding and radio navigation, and to show how these implications can be applied in this field. These considerations are of particular importance in the design of those direction finding and navigation systems where long range operation is an important requirement. Long range is, in this case, a relative term, for low frequency navigation systems distances of 1500 miles may be considered, whereas for VHF and UHF DF's line of sight distances in the neighborhood of 150 miles are "long" range. Briefly, we can say that the effect of thermal noise is proportional to the square root of the bandwidth and the effect of impulse noise is proportional to the bandwidth. Therefore, the narrowest possible bandwidth should be used in order that the best possible signal to noise may be obtained, and it is thus important for the designer to decide what bandwidth actually is required to pass the transmitted intelligence. In the case of position determining systems, this "intelligence" has to be defined. (a-1, b-3, c-1, d-1, e-49, f-analysis)

2749. JOUGUET, M., "On Propagation in Curved Guides of Circular Cross Section," Compt. Rend. Acad. Sci. (Paris), vol. 224, pp. 549-551; 25 February 1947. ABSTRACT: An application of perturbation theory. If the section of a rectilinear guide is not perfectly circular, each wave is split into two components of different phase-velocity. Only E_0- and H_0-waves are stable. Possible practical applications are indicated. (a-3, b-1, c-3, d-3, e-0, f-Theory)

2750. ADCOCK, F., CLARKE, C., HORNER, F., ROSS, W., SMITH-ROSE, R. L., AND PEARCE, R. R., "Symposium of Papers on Direction Finding," JIEE, vol. 94, Part III, No. 28; March 1947. ABSTRACT: Papers by these and other authors are cited individually in the following abstracts, dated March, 1947. (a-4, b-1, c-1, d-5, e-857, f-Various papers)

2751. ADCOCK, F., AND CLARKE, C., "The Location of Thunderstorms by Radio Direction-Finding," JIEE, vol. 94, Part III A, pp. 118-125, March 1947. ABSTRACT: The nature of the radiation from a lightning flash is discussed, and it is shown that the main source of inaccuracy in the crossed-loop cathode-ray types of direction-finder used by the Meteorological Office is due to polarization errors. Methods are considered for improving the accuracy of thunderstorm location. A cathode-ray direction-finder, using a spaced-aerial system and with brilliance modulation applied to the display tube, may be more successful than other systems. A direction-finder with greatly improved instrumental accuracy is described. (a-2, b-1, c-1, d-5, e-424 and 857, f-Discussion)

2752. ALLISON, J., "Final Report of Phase 1 DF Countermeasure Study," Federal Telecommunications Laboratories, Incorporated, Nutley, New Jersey NObsr-39083, Progress Report No. 2; March 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2753. ANDERSON, W. P., AND GRAINGER, E. J., "Low-, Medium- and High-Frequency Communication to and from H. M. Ships," JIEE, vol. 94, Part IIIA, pp. 46-58, March 1947. ABSTRACT: The five-year period preceding the war was one of great activity in the field of naval communications. The separation aboard ship of transmitting and receiving offices and aerials, the development of common power supply and control systems and of new ranges of transmitters and receivers, were parts of a large-scale effort to modernize the communication equipment used by the Navy and to make possible simultaneous transmission and reception in ships. Increasing shore station, particularly ship-shore, traffic, and a more accurate knowledge of propagation phenomena, led to an extensive modernization of shore station equipment and improvements in procedure. As a result of this effort, ships of the Fleets were, at the outbreak of war, well equipped and well manned to carry out long-distance or Fleet communications. The early war years were a period of rapid naval expansion, particularly in connection with auxiliary craft, escort vessels, armed merchant cruisers and co-operation with aircraft. This necessitated the wide use of medium-power radiotelephony transmitters and receivers, and the training of large numbers of operators and merchants skilled in the use and maintenance of these equipments. These r. t. services were provided by existing types of commercial, and later of American naval, equipments. Meanwhile, at the A. S. E., efforts were devoted to the improvement of the frequency stability of transmitters, the reduction of interference aboard ship, the improvement of ships' aerial arrangements, particularly in so far as these were affected by the increased communication requirements, the large-scale use of radar and of anti-aircraft armament, and arrangements for improved maintenance in all classes of H. M. Ships. During the later stages of the war, a new range of communication transmitters and receivers was developed to embody the lessons of the war. These sets are now being fitted and are undergoing trials at sea. The paper concludes with a short statement on developments which are envisaged for the immediate future. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2754. ANGWIN, A. S., "Telecommunications in War," JIEE, vol. 94, Part IIIA, pp. 7-15, March 1947. ABSTRACT: Modern war calls for a rapid and reliable communication system, and this can be achieved only by the properly co-ordinated use of both line and radio systems; each must play its part, and their relative merits must be exploited fully to provide the final complex network necessary for the effective mobilization of the war potential. Such a communication network must embrace the home and operational fronts and provide for the effective transmission of intelligence, in the form of speech or code signals, on a world-wide basis. The maintenance of an adequate broadcasting service for the home, allied and enemy-occupied countries is vital to the maintenance of morale, while propaganda services to enemy countries play an important part. In considering the evolution of our communication system it must be realized that the art of waging war underwent great changes in the period 1914 to 1939, and, in addition, that major advances were made in both line and radio technique during the interval. As a consequence of these factors, radio, while used with success on a relatively limited scale in the First World War, had to play a much more important and vital part in the Second World War. On the line side, the development of multi-channel carrier systems had revolutionized the design of the land-line network, and such systems were extensively employed to provide the main land-line circuits to the higher formations. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2755. APPLETON, E., "The Investigation and Forecasting of Ionospheric Conditions," JIEE, vol. 94, Part IIIA, pp. 186-199; March 1947. ABSTRACT: A general account is given of British work on ionospheric exploration, conducted by vertical-incidence radio sounding, during the period from 1924 to date. The essential feature of such exploration is the determination of the equivalent height of reflection as a function of radiowave frequency, from which relation the electronic structure of the ionosphere may be approximately deduced. From such vertical-incidence measurements it is possible to predict the refractive influence of the ionosphere on waves obliquely incident on it, and thus to estimate, for given ionospheric conditions, the maximum radio frequency which is returned to the ground at any given range from a sending station. Moreover, such estimated maximum usable frequencies for oblique-incident transmissions may themselves be based on a prediction of ionospheric structure made some months in advance. Such advance forecasts of ionospheric-layer electron densities and heights must be based on past experience of diurnal and seasonal behaviour and of the general waxing and waning of ionization densities during the sunspot cycle. Since 1935, measurements of ionospheric layer heights and ionization densities have been supplemented by regular determinations of overall ionospheric reflection coefficients at vertical incidence. In this way some progress has been made in estimating the attenuation of radio waves in practical cases of oblique-incidence reflection. It cannot, however, be claimed that the predictions of

ionospheric absorption are yet as reliable as the predictions of ionospheric refraction. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2756. BARFIELD, R. H., "Statistical Plotting Methods for Radio Direction-Finding," JIEE, vol. 94, Part IIIA, pp. 673-675; March 1947. ABSTRACT: The paper follows naturally on those of W. Ross and R. G. Stansfield, drawing attention to the necessity for a statistical bearing-classification method, as described by the former author, in order to make possible the practical application of the theory of direction-finding "fixes" put forward by the latter. The general problem of "fix" interpretation is stated and the nature of its mathematical solution is indicated in simple terms. A brief account is then given of one very simple method of practical application of the theory which was used with success during the war. A description is also given of a promising mechanical-electrical statistical plotter which was in course of development at the termination of the war. Finally, attention is drawn to the possibility of introducing, with advantage, similar methods of interpreting the observations in modern radio navigational aids. (a-1, b-1, c-1, d-5, e-857, f-Study)

2757. BRAY, W. J., LILLICRAP, H. G., AND OWEN, F. C., "The Fading Machine, and Its Use for the Investigation of the Effects of Frequency-Selective Fading," JIEE, vol. 94, Part IIIA, pp. 283-297, March 1947. ABSTRACT: The function of the fading machine is to simulate the frequency-selective fading which is characteristic of long-distance short-wave radio channels. Fading of this type is usually due to interference between waves which have traversed multiple paths between sender and receiver, and its effect is often to produce distortion of the modulation of radio waves. Many radio transmission systems have been devised with the object of minimizing the effects of selective fading; the fading machine enables different systems to be compared in the laboratory under precisely controlled fading conditions. The equipment described in the paper incorporates three transmission paths, the group time-delay differences between which may be varied in steps from 0 to 7 milliseconds. The phase differences between the paths may be varied manually ("static" fading) or continuously ("dynamic" fading) with fading rates ranging from 0.1 to 10 fades per second. Random noise, either fading or non-fading, may be included so as to synthesize a complete short-wave radio channel. The fading machine may also be used to simulate diversity reception obtained by spaced aerials. Examples, are given of the use of the equipment to assess the merits of double-sideband, single-sideband and frequency-modulated transmission systems with telephony or telephony or telegraphy modulation, under conditions of severe selective fading and high noise level. (a-1, b-1, c-1, d-5, e-857, f-Description)

2758. BRAY, W. J., AND LOWRY, W. R. H., "The Testing of Communication-Type Radio Receivers," JIEE, vol. 94, Part IIIA, pp. 313-327; March 1947. ABSTRACT: Tests for determining the performance characteristics of superheterodyne receivers for use in the frequency range 30 kc/s to 30 Mc/s for the reception of double-sideband amplitude-modulated telephony signals, and c.w. and m.c.w telegraphy signals, are described. The measuring equipment required for the tests is stated and its desirable performance characteristics are summarized. The more important performance characteristics of the receiver are determined by tests covering such features as sensitivity, signal/noise ratio, selectivity, modulation-frequency response (including the acoustic response of the loudspeaker, if fitted), non-linearity and distortion of the a.f. output. The sensitivity tests include the use of a noise generator for the determination of the noise factor. Unwanted responses due to (i) a single signal, and (ii) the intermodulation of two signals, are described, together with the methods of measurement. The limitation of the effective selectivity of a receiver as a result of the non-linearity of radio-frequency and intermediate-frequency stages is referred to and assessed by means of the cross-modulation and blocking characteristics. The measurement of the performance of the automatic-gain-control and automatic-frequency-control systems is discussed, also the measurement of the drift of the frequency-change oscillator(s). Measured characteristics for typical receivers are given in order to illustrate convenient methods for the presentation of the results, and the values to be expected in practice. (a-1, b-1, c-1, d-5, e-857, f-Description)

2759. BROWN, A. H., "The Consol Navigation System," JIEE, vol. 94, Part IIIA, pp. 968-976; March 1947. ABSTRACT: The Consol navigation system embodies a chain of independently operated medium-frequency radio stations with respect to each of which bearings may be taken with the aid of a standard communication receiver. The principles of operation of the constituent stations are given and the equipment required is briefly described. Factors influencing the accuracy of the system and ranges to be expected in various parts of the world are discussed. (a-1, b-1, c-1, d-5, e-857, f-Description)

2760. BURTT, G. J., AND WHIPPLE, R. T. P., "Medium-Frequency Direction Finding in H. M. Ships," JIEE, vol. 94, Part IIIA, pp. 838-856; March 1947. ABSTRACT: In Part 1 of the paper the present state of medium-frequency direction-finding in H. M. ships is reviewed. There have been no fundamental changes in the system employed in recent years. The standard method in use is that of a screened crossed-loop aerial with low-capacitance screened feeder cables connected to a radiogoniometer and a receiver, using audio observation on the null signal to determine bearing. A number of advances have been made in the radio equipment used, both in the aerial system and its associated feeder cables, in the design of radiogoniometers and bearing corrector circuits, and in the compact assembly of the various units into one D/F receiver housing. Part 2 consists of a general discussion of the effect of reradiation from the ship's hull and deck structures in medium-frequency direction-finding. When the wavelength exceeds about four times the length of the ship, the calibration curve for a Bellini-Tosi direction-finder becomes independent of frequency, and the "blurring" becomes negligible. These low-frequency calibration curves are of a very simple type and are somewhat analogous to the calibration curves of a magnetic compass. They have an equation of type

$$\tan(\phi - \phi_0) = C \tan(\phi - \phi_0 + \delta)$$

where ϕ_0 and C are constants, ϕ is the relative D/F bearing and δ is the correction (i.e., minus the error). As with the magnetic compass, the errors can easily be compensated. This is done by turning the loops through a certain angle θ_0 and applying "inductance correction," that is to say inserting extra inductance in one or other of the loop circuits. It is shown how the constants in the above equation may be calculated from hydrodynamical potential theory in many cases, and detailed calculations are made for a deck of rectangular cross-section and for a site near the edge of the bridge. The phase-quadrature effect, giving rise to "blurring," is also considered. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2761. CAPLIN, F., AND BAGLEY, J. H., "A Mobile Spaced-Loop Direction-Finder," JIEE (London), Part IIIA, vol. 94, no. 15, pp. 676-682; 1947. ABSTRACT NO. 1: A direction finder covering the frequency range 2 to 20 Mc and giving a silent arc of -50 for a field strength of 8 microvolts per meter at 2 Mc to 2 microvolts per meter at 20 Mc. It can be used when high-angle sky waves predominate. Direction and sense finding in one operation by rotating the loops and watching a meter is achieved by using electronic switches to couple a resistance to each loop alternately. The equipment can be transported in a jeep trailer. ABSTRACT NO. 2: During the war a direction-finder was required for taking bearings on ionosphere-reflected waves which arrive at a small angle to the vertical and which are subject to fading. The equipment had to be highly mobile, suitable for transport by air, and capable of withstanding extreme ranges of temperature and humidity, easily erectable and simple in operation. A high order of accuracy had also to be retained. A rotating spaced-loop D/F station developed during 1944-45, to comply with these requirements, is described. To simplify the taking of bearings under fading conditions, a visual indicator was incorporated which was also suitable for speedily resolving the ambiguities associated with spaced-loop systems. ABSTRACT NO. 3: A War Office requirement arose during the war for a direction finder suitable for taking bearings on ionosphere-reflected waves which arrive at a small angle to the vertical and which are subject to fading. It was necessary that this equipment should be highly mobile, suitable for transport by air, and capable of withstanding extreme ranges of temperature and humidity. Ease of erection and simplicity of operation were also to be essential features. Notwithstanding all this, a high order of accuracy was to be retained. The paper describes a rotating spaced-loop D/F station that was developed at the Signals Research and Development Establishment during 1944-45, to comply with these requirements. In order to simplify the taking of bearings under fading conditions, a visual indicator was incorporated which was also suitable for speedily resolving the ambiguities associated with spaced-loop systems. (a_1-3, a_2-5, a_3-1, b-1, c-1, d-5, e-857, f-Description)

2762. CLEAVER, R. F., "Note on a Short-Range Position-Finding System Using Modulated Continuous Waves," JIEE, vol. 94, Part IIIA, pp. 984-989; March 1947. ABSTRACT: The paper describes a position-finding system by which the polar co-ordinates of any suitably equipped aircraft can be determined at a single base station using phase-comparison range-finding apparatus and a vhf automatic direction-finder in conjunction with conventional communication equipments. An experimental model is described in which azimuth and range are displayed on a single cathode-ray oscillograph, which may be installed in an airport control tower. Range is indicated without ambiguity up to 100 nautical miles, and there is no azimuthal ambiguity. So far the model has been used primarily to demonstrate the principles of the

system, in conjunction with an aircraft fitted with an experimentally modified Service type of vhf communication equipment. The results of a limited number of tests suggest that, with airborne equipment specifically designed for use with the system, the probable error in range measurement should be less than 1 mile. Azimuthal accuracy is not here discussed, but in a companion paper it is shown that the probable instrumental error of the direction-finder is less than 1.5 deg, implying a probable lateral error less than 2.5 miles at the maximum non-ambiguous range of 100 nautical miles. (a-1, b-1, c-1, d-5, e-857, f-Description)

2763. CLEAVER, R. F., "The Development of Single-Receiver Automatic Adcock Direction-Finders for Use in the Frequency Band 100-150 Mc/s," JIEE, vol. 94, Part IIIA, pp. 783-797; March 1947. ABSTRACT NO. 1: The paper describes the development of automatic direction-finders primarily intended for measuring the bearings of aircraft, on signals radiated in the frequency band 100-150 Mc/s. The basic systememploys fixed elevated-H Adcock antennas and a single receiver, and, with the exception of the earliest model, all instruments give cathode-ray oscillograph indication. An examination of the advantages and limitations of fixed-antenna automatic direction-finders employing two or more receivers leads to an account of the reasons for the adoption of a single-receiver system in the present development. The principles and evolution of this system are explained with reference to the original experimental models, whose performance is discussed. A naval direction-finder based on one of the experimental models is described in detail, and statistics are presented to show that the probable instrumental error varies from about 0.6-1.25 deg over the frequency band, after compensation for octantal error. Bearings can be measured on signals of field strength down to 7 μV/m or less. The paper concludes with a description of direction-finders for use on land. One of these, under current development, will be capable of unattended operation on two alternative frequency-channels, with bearing indication and full remote-control at points up to twenty miles distant. ABSTRACT NO. 2: The signals from the two directional elements of the elevated H-adcock antenna system are modulated at different frequencies with suppression of the carrier, which is later restored in constant phase by the addition of a signal from a central omnidirectional antenna. The combined signal is passed through the receiver, whose output contains two af components. Their amplitudes and phases give the bearing and sense of the received signal, which are indicated by a cathode-ray tube display. Two experimental models, and a naval model based on these, are discussed. The probable instrumental error in the naval model is about 0.5 to 1.25° after allowing for octantal error. The required field strength is 7 microvolts per meter or less. Instruments for land use are considered: a direction finder capable of unattended operation on two frequency channels and having full remote control facilities is now being developed. ABSTRACT NO. 3: Describes the development of automatic direction-finders (adf's) primarily intended for measuring the bearings of aircraft, on signals radiated in the 100-150 Mc/s band. The basic system employs fixed elevated-H Adcock aerials and a single receiver, and, with the exception of the earliest model, all instruments give c.r.o. indication. An examination of the advantages and limitations of fixed-aerial adf's employing two or more receivers leads to an account of the reasons for the adoption of a single-receiver system in the present development. The principles and evolution of this system are explained with reference to the original experimental models, whose performance is discussed. A naval D/F based on one of the models is described in detail, and statistics are presented to show that the probably instrumental error varies from about 0.6-1.25° over the frequency band, after compensation for octantal error. Bearings can be measured on signals of field strength down to 7 μV/m or less. (a_1-1, a_2-5, a_3-5, b-1, c-1, d-5, e-857, f-Description)

2764. COOKE, D., JELONEK, Z., OXFORD, A. J., AND FITCHE, E., "Pulse Communication," JIEE, vol. 94, Part IIIA, pp. 83-105; March 1947. ABSTRACT: The title of this paper embraces a wide range of technical development, but its scope will be limited to a discussion of the principles employed and the problems involved in the use of a recurrent pulse-train as a carrier or sub-carrier for the transmission of intelligence, particularly speech. Except in so far as they react upon the modulated pulse-train, neither the actual communication medium nor its terminal equipment will be dealt with. The paper is divided into three main parts; Part 1 is a broad general review and conclusions, Part 2 a discussion of some features from a theoretical point of view, and Part 3 a review and discussion of the available circuit techniques. A brief review is presented of the present state of development of pulse communication, its application, theoretical basis and circuit techniques. It is divided into three parts. In Part 1, the four basic types of pulse modulation, namely amplitude, length, phase and frequency modulation, are briefly described, and the history of the subject is touched upon. Time-allocation multiplex is discussed, and a broad technical comparison with frequency-allocation multiplex is made. The more important specific problems of the technique, such as the best pulse shape and repetition frequency, signal/noise ratio and privacy, are discussed. The application to a point-to-point very-short-wave radio system is considered, with special reference to the pros and cons of pulse modulation compared with c.w. modulation. The possibilities of its use on cables and in omni-directional radio systems, including broadcasting, are examined, as are the anti-fading properties of pulse transmission on longer radio waves for long-distance work. In a Section on future trends of development it is stressed that more quantitative data on actual working systems is required; it is submitted that new applications may arise for which pulses may be particularly suitable; lines of development for time-allocation multiplex are indicated; and the likely evolution of pulses as a complementary technique to other systems of very-short-wave communication is envisaged. In Part 2, the results of theoretical and experimental analysis of some specific problems of the technique are presented graphically and are discussed. The spectrum of modulated pulses is given, and utilized to estimate the distortion and intelligibility of received speech. The minimum repetition frequency for intelligible transmission is determined experimentally. A consideration of noise problems introduces a comparison of the merits, from the point of view of signal/noise ratio, of typical pulse-modulation systems as applied to single-channel and multiplex communication. The pulse systems are compared amongst themselves and with conventional cw amplitude- and frequency-modulation systems. The noise performance below threshold has an effect on the conclusions. A note on a theoretical investigation of a pulse-synchronization system is added. The preferred length of transmitted pulses is discussed from the point of view of best use of transmitted power. An investigation of the adjacent-channel radio interference leads to theoretically best shapes of transmitted pulses and a simplified specification of the pulse shape is suggested and discussed. In Part 3, a brief survey is made of the way in which circuit elements are combined to produce pulse-communication systems. Some of these circuit elements are already well known in the art and have been previously described with reference to radar circuit design, whilst others have been developed expressly for communication purposes. The detailed operation of systems is fully described in the supporting papers, and in this Part an attempt has been made to present a fairly complete picture of the methods which are known to have been used up to the present, and to give an opinion on their relative merits. A number of functions are common to most equipments, such as pulse modulation, demodulation, channel spacing, slicing and ringing, etc., and the techniques developed to carry out these operations are enumerated and criticized. Finally, suggestions are made as to which are the most promising lines for further development. (a-1, b-1, c-1, d-5, e-857, f-Discussion)

2765. CRAMPTON, C., AND TOCZYLOWSKI, H. S., "Field-Strength Estimation by Means of High-Frequency Direction-Finders in H.M. Ships," JIEE (London), Part IIIA, vol. 94, no. 15, pp. 809-814; March 1947. ABSTRACT NO. 1: The measurement of the field strength of signals received on two types of high-frequency direction finder and the application of the results to the estimation of the range of transmitters of known characteristics are described. The accuracy of the method and its useful range are given, together with details of experimental checks. ABSTRACT NO. 2: Simple modifications of H/F direction finders, together with a knowledge of the pickup factor of the aerial systems with which they were used, enabled them to be applied in ships as field strength meters. Over a sea path, the distance of a transmitter assuming some knowledge of its power and aerial system can thus be estimated. The method was used against U-boats. The modifications to the receivers are described and experiments confirming the method are given. (a_1-2, a_2-5, b-1, c-1, d-5, e-857, f-Measurement)

2766. CRAMPTON, C., "Naval Radio Direction-Finding," JIEE, vol. 94, Part IIIA, pp. 132-153; March 1947. ABSTRACT NO. 1: An account is given of the progress in naval radio direction-finding both on land and in H.M. Ships during the last ten years. On land, the Admiralty has been specially concerned in high-frequency (3-30 Mc/s) direction-finding. Some parts of the very-high-frequency range (30-300 Mc/s) are also of interest, notably in the band used for communication with fighter aircraft, 100 to 156 Mc/s. In the field of H/F direction-finding, the factors limiting the accuracy at present obtainable with the standard Adcock-type apparatus are systems in H/F direction-finding on land, in which it is suggested further research would be profitable. The paper describes further developments in ship-board mf direction-finding, and the research and development work carried out in the H/F, VHF, UHF (300-3000 Mc/s) and shf (3000-30000 Mc/s) bands. It is shown that accurate direction-finding on high frequencies in ships offers considerably greater difficulties as compared with those encountered on mf. This is due to the greater disturbances caused by the secondary fields radiated by various parts of the ship's structure and rigging. It is also shown how the essential conditions have been derived for siting the direction-finder aerial in a position where the effects of secondary radiation will not excessively degrade the per-

formance. The paper considers the principles of design employed in the ship-board H/F direction-finder and explains how the various requirements of accuracy, sensitivity, coverage of the whole H/F band with a minimum of design and operating complexity, reliability, sense-finding and quickness in operation, involve a compromise in which the highest performance in any one particular is unattainable. The essential performance data are given for the apparatus widely fitted during the recent war. The various aspects of research and development in VHF direction-finders for ships are considered and it is shown that the ship conditions are less adverse in the VHF case then they are in H/F direction finding. In keeping the paper to a reasonable length, only a brief introduction is given to the work done in the wide field of UHF and SHF direction-finding. Many of the techniques in these frequency bands merge with those of radar, with the important difference that direction-finding must always attempt to cover the widest possible frequency range with the simplest possible apparatus. The applications of radio direction-finding to naval purposes are briefly stated. ABSTRACT NO. 2: A brief account of land-based D/F systems used by the Admiralty and of the German Wullenweber steerable-lobe system. Shipborne systems for MF, H/F, and VHF are described, with particular attention to the position of the antenna system for optimum accuracy. The effect of reradiation by various structures is considered in detail and curves for estimating the probable errors are given, together with typical calibration curves for H/F and VHF systems. The sensitivity of a crossed loop H/F system is examined; the probable range of a transmitter may be estimated from the strength of he signal received. Curves are given showing how a spaced-loop system can give increased accuracy at H/F. (a_1-1, a_2-4, b-1, c-1, d-5, e-817 and 857, f-Survey with 33 references, Wullenwebers. See Abstract No. 1505)

2767. CRAMPTON, C., WHIPPLE, R. T. P., AND MUGRIDGE, A. H., "The Errors in Bearings of a High-Frequency Direction-Finder Caused by Reradiation from a Nearby Vertical Mast," JIEE, (London), Part IIIA, vol. 94, no. 15, pp. 815-822; March 1947. ABSTRACT NO. 1: The largest errors occur when the mast is in resonance at the frequency used. ABSTRACT NO. 2: In most ships there is one metallic structure (e.g., a mast) which is considerably taller than any other object on board. It is found that the largest errors in a HF direction-finder installed in a ship are generally encountered when this conductor is in resonance. All other sources of error are here neglected and an investigation is made of the error and blurring caused by a single re-radiating vertical mast. The results are applied to assess the suitability of different sites for the D/F aerial. ABSTRACT NO. 3: Contains derivation of reradiation error equations used in the analysis of the simple loop. Also gives some simple expressions useful for reradiated field amplitude as a function of distance at the mast resonance frequency. (a_1-6, a_2-5, a_3-4, b-1, c-1, d-5, e-857, f-Theory and analysis)

2768. CRAMPTON, C., STRUSZYNSKI, W., MARSHALL, J. H., AND WOOLLEY, J. C., "The Performance of High-Frequency Direction-Finders in Various Types of H. M. Ships," JIEE, vol. 94, Part IIIA, pp. 798-808; March 1947. ABSTRACT: The reasons for the choice of the fixed crossed-loop aerial system, for shipborne HF D/F equipment operating on ground waves, are summarized. The problem of siting an HF D/F aerial is discussed, with particular reference to the effects of vertical re-radiators and the hull. The importance of elevating the HF D/F aerial above all the superstructure in a ship is stressed. Fitting and rigging requirements are stated; particularly those concerning the mast supporting the D/F aerial, the insulation of stays, the condition of communication aerials, and the screening of the D/F office. The method of carrying out a calibration is described. The method of estimating the overall accuracy of an HF D/F installation is discussed, and the value of the maximum acceptable correction to D/F bearings is estimated. Calibration results for some typical installations are shown, and a method of presenting these in the form of "performance curves" is explained. The performance curves for installations in various kinds of ship are given and analysed. The possibilities of improvements in performance are discussed. The provision in ships of an accurate and reliable HF direction-finder for use on ground waves and having a continuous frequency coverage from 1 Mc/s to 24 Mc/s, presents many difficulties. A fixed crossed-loop aerial was developed for this purpose, as providing the most suitable solution to the problem. Even when elaborate precautions are taken, the performance of this system is much inferior to that of a shipborne D/F equipment for medium frequencies (60-1000 kc/s). Accurate and reliable direction-finding in ships is only possible when the D/F aerials can be placed in such a position that the secondary fields caused by re-radiation are small compared with the incident field, and such that the secondary field does not vary greatly for a small change in bearing or frequency. In the case of mf direction-finders in ships, it can be stated that if care is taken to place the D/F aerial in a fairly clear position, secondary fields are comparatively small. Further, even if an unfavourable position must be accepted, so that the secondary fields are large, some simple form of electrical or mechanical compensation can be applied, since the secondary fields are in most cases of a type which does not change appreciably with bearing or frequency. In the band 1-24 Mc/s (300-12.5 m wavelength), a number of parts of the ship's structure and rigging will successively assume the quarter-wave resonant condition as the wavelength is progressively reduced, e.g., a mast about 100 ft high will resonate at about 2.5 Mc/s, the bridge at about 5 Mc/s, and a funnel at about 7 Mc/s. There are also numerous other small parts of the ship which are tall enough to cause them to resonate at other frequencies below 24 Mc/s. Some of the structures mentioned will assume a second, third, and even higher mode of oscillation within the working frequency band. Any position in a ship where HF D/F aerials may be installed is under the influence of a complex secondary field caused by re-radiation from a large number of re-radiators "tuned" to different frequencies within the working range. As the distances of re-radiators from the D/F aerial are generally comparable with the wavelength, a small change in bearing or frequency produces a large change in the relative phase of the fields, and therefore affects appreciably the magnitude and the direction of the resultant field. It is therefore necessary, in order to make allowance for the systematic errors due to these structures, to have a calibration curve showing corrections for all relative bearings, at a frequency sufficiently close to the frequency in use for the errors caused by the difference to be negligible; and care is needed in both calibrating and using the apparatus. It has been shown too that a direction-finder will function with errors up to 20 deg at the resonant frequency of a single vertical quarter-wave re-radiator when at a horizontal distance from the base of the re-radiator equal to three times its height. A simple numerical calculation shows, however, that it is impossible to find a position near the deck of any ordinary ship or vessel that will satisfy the spacing requirement for all the ship's re-radiators simultaneously. Moreover, the combined effect of a number of re-radiators, even if each individual re-radiator were spaced as specified, will produce maximum errors of more than 20 deg on some frequencies. It has also been shown in the same paper that there is a substantial reduction of the re-radiated field with an increase in the angle of elevation of the D/F aerial from the base of the re-radiator. This effect is especially marked when the site chosen is at a higher level than the top of the re-radiator. Then, even for small horizontal distances, distortion of the field is very small. Elevation of the aerial well above all superstructure is therefore the main requirement in the siting of a fixed crossed-loop HF D/F aerial in a ship. A position at the top of the tallest mast in the ship is the most favourable site that can be found. An alternative site, much inferior to the previous one, is at the top of another mast that is usually much lower (e.g., in destroyers, a special HF D/F mast about 30 ft high and at least 150 ft distant from the foremast). Elevation of the D/F aerial above the deck is also necessary to avoid the effect of additional distortion of the primary field by the horizontal currents induced in the hull. This effect is most serious in the resonant condition, when the freeboard (i.e., the height of the deck above the waterline) is equal to about a quarter-wavelength. (a-1, b-1, c-1, d-5, e-843 and 857, f-Discussion)

2769. EARP, C. W., AND GODFREY, R. M., "Radio Direction-Finding by the Cyclical Differential Measurement of Phase," JIEE, vol. 94, Part IIIA, pp. 705-721; March 1947. See also Elec. Commun., vol. 26, pp. 52-75; March 1949. ABSTRACT: This paper introduces a new general type of direction-finding and beacon system in which an appreciable reduction of the usual site errors is achieved by the use of aerial structures of wide aperture, the ambiguity normally associated with such systems being resolved by the manner in which the aerials are connected. Practical forms of the new system generally consist of a circularly disposed array of vertical aerials which are cyclically connected, singly or in groups, by a process of electronic commutation to a receiving device. The basic principle can best be appreciated by considering a single vertical aerial connected to a receiver and caused to move continuously along a circular path in the horizontal plane at a uniform rate. The motion of the aerial would impose a phase modulation on any received signal, and the horizontal direction of arrival of the signal could be determined if this modulation could be related to the law of motion of the aerial. Several types of direction-finder using the same basic principle are possible; these are outlined and classified. The practical and theoretical advantages of the system are discussed, and two direction-finders, one for use in the very-high-frequency band, the other in the high-frequency band, are described. The paper is confined to an account of the more important aspects of the subject, attention being paid to the fundamental requirements of the system and the means whereby they are met in practice. The mechanism whereby site errors are suppressed is outlined, and a comparison with the orthodox Adcock types of direction-finder is made, in which it is shown that, just as a phase-modulation communication system has certain inherent superiorities over an amplitude-modulation system, so the method of phase comparison has similar advantages over other forms of direction-

finder. (a-1, b-1, c-1, d-5, e-857, f-Description. See Abstract No. 1396)

2770. FITCH, E., "The Spectrum of Modulated Pulses," JIEE, vol. 94, Part IIIA, pp. 556-564; March 1947. ABSTRACT: Some methods proposed for evaluating the spectra of modulated pulse trains are discussed. The basic pulse-frequency, -phase, -length and -amplitude modulation systems are defined and the spectrum of a train of rectangular pulses sinusoidally modulated in any one of these ways is derived. Modulation by more than one tone is also considered. It is shown that in none of these methods is there any harmonic distortion or audio crosstalk. An harmonic distortion arises from side-bands of harmonics of the pulse repetition frequency, and graphs are given to illustrate its magnitude. The formulae are extended to cover non-rectangular pulses, and it is shown that the distortions to be expected are practically the same as for rectangular pulses. The reproduction of transients is briefly examined. It seems that they suffer little distortion in form but that their timing is modified by the pulse modulation, the maximum time-shift being half the pulse repetition period. (a-1, b-1, c-1, d-5, e-857, f-Discussion)

2771. FLETCHER, H., "A Simple Method of Reducing the Polarization Error of a U-Type Adcock Direction Finder," JIEE, vol. 94, Part IIIA, pp. 771-782; March 1947. ABSTRACT: A brief description of the nature of polarization error, and the historical background of earlier work and measuring techniques, introduces the instrumental problems associated with improving the performances of U-type Adcock direction-finders, particularly on sites of poor conductivity. An Army transportable U-type Adcock direction-finder, having surface feeders and an earthing system designed for speedy installation, was tested on a site of good conductivity, and compared well with similar but more elaborate systems, indicating a standard-wave error of only a few degrees. A series of tests on ground of abnormally low conductivity, over the frequency range 2-10 Mc/s, showed that a simple counterpoise of eight radial elements could have an effectiveness comparable with that of elaborate earthing arrangements of a more permanent nature. Quantitative comparisons of the effects of various earthing arrangements (buried feeders and extended earthing plates associated with Marconi direction-finders Types DFG24/2 and DFG25) are necessarily restricted to the small frequency range 2-5 Mc/s, on account of limitations which prevent the local source from simulating plane (or natural) wave conditions and also to enable a simple workable analysis, applicable only to electrically small systems, to be used. However, this lower region of the high-frequency band is a part where reduction of polarization error is particularly required. The computed performance of a simple unscreened U-Adcock direction-finder reveals that adding a feeder screen without adequate earth return at its ends, can have a deleterious effect, but with care a fair improvement over a closed loop (reduction in standard-wave error from 35 deg to 20 deg) can be achieved on an exceptionally poor site. On a good site the performance of a U-Adcock direction-finder, even without feeder screens, is far superior to a loop. Tests on an average type of unfavourable site to be found in this country, show that the use of an eight-radial counterpoise, which, on average reduces polarization error by 4 to 1, results in a performance comparable with that for a very good site. Data available from polarization-error measurements on a direction-finder with a large circular earth mat refer only to limited measuring conditions and do not allow a strict comparison, but from general considerations a greater efficacy in reducing polarization error as compared with an 8-wire radial system can be expected. The present tests, though limited, reveal fundamental points which would suggest that a layer of crushed coke might confer similar benefits to an earth mat. The simplicity of the counterpoise of eight long radials is such, however, that its use is suggested for all but the best sites, so as to make performance less dependent on weather, and because it facilitates the approach of an external cable with a minimum of disturbance. Even with the suggested coke layer its use should still be beneficial. (a-1, b-1, c-1, d-5, e-857, f-Summary)

2772. GRIFFITH, R. M., "The Extension of Wireless Direction-Finding Techniques to Very High Frequencies for Naval Use," JIEE, vol. 94 Part IIIA, pp. 727-740; March 1947. ABSTRACT: During the war the subject of radio direction-finding was intensively studied and expanded in many directions. One of the most fruitful fields of research was the extension of the methods already familiar in medium-frequency practice to the highest practicable limits of frequency, and the development of complementary techniques that would make accurate direction-finding possible up to the highest frequencies in current use. The apparatus developed was required to be suitable for naval sea-going conditions. These imply difficult siting conditions and considerable mechanical strength to withstand the effects of gun blast, vibration and swaying. The paper describes the methods adopted for the electrical design, and shows that satisfactory direction-finders can generally be developed for ship-board use in any frequency band. (a-1, b-1, c-1, d-5, e-857, f-Evaluation)

2773. HARROD, K. W. G., "The Accuracy of Sky-Wave Delay Measurements," JIEE, vol. 94, Part IIIA, pp. 893-898; March 1947. ABSTRACT: The paper describes an experimental investigation of the limitations imposed by the ionosphere upon the accuracy of sky-wave path-time measurements. The measurements were made at intervals between August, 1942, and the middle of 1944, covering the frequency range 2-16 Mc/s, and consisted of observations at vertical incidence and at oblique incidence over ranges up to 6000 km. The limiting accuracy of path-time measurement at vertical incidence was found to be of the order of ± 5 μsec, while at oblique incidence it was in the region of ± 10 to ± 20 μsec under normally favourable conditions. The instrumental techniques involved in the various phases of the work are briefly described, and the probable mechanism of the short-period variations about the mean path-time is discussed. (a-1, b-1, c-1, d-5, e-857, f-Descriptive analysis)

2774. HATCH, J. F., "Developments in H. F. Direction-Finder Shore Stations Using Adcock Aerials," JIEE, vol. 94, Part IIIA, pp. 683-692; March 1947. ABSTRACT: High-frequency direction-finders (operating on a frequency band of 1.5 to 30 Mc/s) have been used extensively during the war for shore station D/F networks. The aerial system employed has been almost exclusively the buried-U Adcock type. The main considerations for using this type of aerial system were as follows: (a) Small polarization error. (b) Wide frequency-band coverage. (c) Adequate sensitivity. (d) Suitability for use either with radiogoniometers or cathode-ray type direction-finders for rapid bearing indication. The main developments in H/F direction-finding have been in the reduction of polarization error by the use of earth screens, and an attempt to reduce phase interference effects by ray-separation technique. Improved methods have also been devised for aerial balancing and for compensating for instrumental irregularities. In this connection an internal injection method has been developed for checking the overall balance of aerials, feeders and radiogoniometers, especially for use on sites where an external local calibrating transmitter is unreliable. Attention has been paid to improvements in design of radiogoniometers, and instruments have been developed for injecting calibrated voltage ratios into the field coils for laboratory checks of instrumental performance. A special type of local calibrating transmitter has been developed which employs frequency modulation for rapid local calibration checks and more especially for sense circuit calibrations. This has proved extremely useful in detecting minute aerial irregularities occurring over narrow frequency bands. An investigation has been carried out into the operational performance of various D/F systems on all classes of traffic. A comparison has been made of the merits of visual and aural presentation and their effect on accuracy, speed of operation, flexibility and simplicity of maintenance. The advantages of group station working are discussed, and finally a type of instrument is described the design of which is based on the results of operational statistics. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2775. HICKMAN, J. B., "Military Radio Communications," JIEE, vol. 94, Part IIIA, pp. 60-73; March 1947. ABSTRACT: The paper shows the importance and traces the development of radio communication for the modern, highly mobile army. It describes the principal field radio equipments used in military communications and gives an account of their essential qualities. A description is given of the war-time efforts in design and production on these types of radio equipment and the measure of improvement achieved. The paper gives the trend of design in modern military radio equipment, showing the tendency to utilize very-high-frequency and super-high-frequency transmission in substitution for high frequency for many roles. It also indicates that frequency modulation, television, facsimile and integrated line and radio systems may form part of future development projects for military communications. (a-1, b-1, c-1, d-5, e-857, f-Summary)

2776. HOLLINGHURST, F., AND SOWTON, C. W., "Resume of V. H. F. Point-to-Point Communication," JIEE, vol. 94 Part IIIA, pp. 115-130; March 1947. ABSTRACT: This paper outlines the development of VHF radio-telephone point-to-point communication in Great Britian prior to 1939 and from 1939 to 1946, and deals briefly with similar developments in other countries. Consideration is given to the many engineering aspects of the planning, provision and operation of VHF radio links, with particular reference to current practice in the British Post Office. A typical multi-channel radio-telephone link is described, and some special war-time applications of VHF transportable radio-telephone equipment for point-to-point communication are mentioned. The paper concludes with some notes on possible

future trends in the development of short-distance point-to-point radio-communication. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2777. HORNER, F., "An Experimental Spaced-Loop Direction-Finder for Very High Frequencies," JIEE (London), Part III, vol. 94, pp. 126-133, March 1947; Discussion, pp. 133-140. ABSTRACT NO. 1: This direction finder uses two single-turn 28-centimeter square vertical-coaxial-screened loops 146 centimeters apart, and the field strength required for an arc of silence of ±5° is 20 microvolts per meter for a vertically polarized ground wave between 30 and 100 Mc. For high-angle waves (e.g., from aircraft) it appears to be more accurate than the rotating-H Adcock type provided that care is taken to eliminate errors due to loop resonances. A similar instrument using 92-centimeter loops 220 centimeters apart to give increased sensitivity (4μV/m)at 30 Mc. is described briefly. The polarization errors introduced by calibrating with an elevated transmitter, so close that the wave from it has appreciable curvature, is evaluated and discussed. ABSTRACT NO. 2: The direction finder is for use with vertically polarized waves in the frequency range 30-100 Mc/s. The screened loops are 28 cm square and are mounted coaxially with a spacing of 1.57 m. The sensitivity of the system in conjunction with a good receiver is such that a field strength of 20μ V/m is required for a silent swing of ±5°. Means are provided for selecting the required minima of the polar diagram. Instrumental errors tend to become excessive at the resonant frequencies of the aerial system or its screen, but may be minimized by careful construction and adjustment of the system. Reciprocal error can be reduced to < 1/2° at all frequencies in the above range. Errors measured with a local test transmitter at an angle of elevation of 25° with a dipole aerial inclined at 60° to the vertical have been compared with calculated errors due to wavefront curvature alone. There were no instrumental polarization errors > 2° in the range 30-100 Mc/s under these test conditions. (a_1-3, a_2-1, b-1, c-1, d-5, e-473, f-See Abstract No. 1576 for possible original citation)

2778. JARVIS, R. F. J., AND BROCKBAND, R. A., "Multi-Channel Radio-Frequency Amplifiers," JIEE, vol. 94, Part IIIA, pp. 389-397; March 1947. ABSTRACT: The economic advantages of wide-band multi-channel transmission either by radio or high-frequency cable links were appreciated early in the war, and systems of this type were developed on a wide scale. The simultaneous amplification of the channel signals without introducing noticable distortion or mutual interference presented highly specialized problems which were solved economically in the majority of cases only by the use of negative feed-back. The most outstanding contribution to amplifier design during the period 1939-1945 was the analysis by H. W. Bode of feedback amplifier networks which established the design procedure on a firm logical basis. No appreciable improvement took place in valves for wide-band amplifiers up to 50 Mc/s, and it would appear that a near-maximum amplifier performance is now being obtained with existing valves so that the next major development might be expected in the thermionic field. Many different types of amplifier were developed during the war period, usually to meet urgent specific demands, and a representative selection is described briefly in the paper. The examples range from a highly stable (60-db feedback) 100-mW repeater for speech channels on a coaxial cable, to a transmitter amplifier capable of feeding up to 12 simultaneous 40-watt telegraph signals in the frequency band 3-8 or 8-15 Mc/s direct into a rhombic aerial. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2779. MATTHEWS, C., AND BORROW, R. L. A., "Mutual Radio Interference in H.M. Ships," JIEE, vol. 94, Part IIIA, pp. 418-426; March 1947. ABSTRACT: The purpose of this paper is to outline the subject of interference to and from radio and radar installations in H.M. ships. Interference caused by machine-generated radio frequencies is not dealt with, as this type of interference is not greatly different in ships from similar conditions elsewhere. The general principles involved in avoiding mutual interference caused by simultaneous transmission and reception in the same ship have been well known for many years, and these principles had been enforced in the design and installation of radio equipments in H.M. ships prior to 1939. During the war these principles could not be maintained, owing to the necessity to fit commercial equipment, and, with the coming of radar, interference became worse than anything previously experienced. To ameliorate these conditions without drastic re-design of the offending equipment, various expedients had to be devised which are here described. (a-1, b-1, c-1, d-5, e-857, f-Description)

2780. MITCHELL, H. T., AND KILVINGTON, T., "A Time-Multiplex Radio-Frequency Phase-Comparison Method for Navigational Systems," JIEE, vol. 94, Part IIIA, pp. 977-983; March 1947. ABSTRACT: A method of using time multiplex to provide a continuous wave navigational aid is discussed theoretically. The practicability of the system has been demonstrated by the construction and experimental use of low-power equipment. The use of the scheme for various navigational problems is discussed and the present programme of development is outlined. (a-1, b-1, c-1, d-5, e-857, f-Theory)

2781. MUMFORD, A. H., "Long-Distance Point-to-Point Communication," JIEE, vol. 94, Part IIIA, pp. 23-43; March 1947. ABSTRACT: The paper outlines the expansion of the long-distance point-to-point system during the war years and some of the advances in technique which have made for more reliable communication. The expansion of the network maintained by the British Post Office, and the improved techniques introduced into its point-to-point radio systems, are considered representative of the general picture and are discussed, the more detailed discussion of the various advances being left to the supporting papers. The effect of the war on the communication system is outlined, some of the problems and the methods of solution are described, the relative advantages of single-sideband operation are considered, and an analysis is given of the several telegraph systems. The importance of precise frequency control is stressed and the trends in design and performances achieved are quoted. A brief analysis is made of the rhombic and multi-element array, and the aerial-connecting problems experienced both at large transmitting and receiving stations are outlined. Reference is made to the importance of ionospheric data forecasting in the planning and operation of a long-distance network. Finally, an attempt has been made to outline future trends in terms of the world-wide communication network. (a-1, b-1, c-1, d-5, e-857, f-Descriptive survey)

2782. PATTERSON, C. C., "Summarizing Review," JIEE, vol. 94, Part IIIA, pp. 16-22; March 1947. ABSTRACT: This is a review on radio communications and contains brief mention of navigational aids and direction finding developments in England during World War II. (a-4, b-1, c-1, d-5, e-857, f-Survey)

2783. PEARCE, R. R., "Some Experiments on Conducting Screens for a U-Type Spaced-Aerial Radio Direction-Finder in the Frequency Range 600 to 1200 Mc/s," JIEE (London), Part III, vol. 94, pp. 115-117; March 1947; Discussion, pp. 133-140. ABSTRACT NO. 1: A simple direction finder was used to investigate the effect of large earth screens. A metal plate (or a λ/12 mesh of wire) not less than 4λ in diameter was required to reduce the polarization error of the direction finder to about 1°. ABSTRACT NO. 2: A description of a simple U-type rotatable radio direction-finder, which was used to investigate the improvement in performance of short-wave direction-finders obtained by the use of large earth screens, and to determine the smallest ratio of screen-size/wave-length for which the polarization errors were reduced to a satisfactorily small value, ~ 1 deg. The screens were constructed of sheet metal, wire netting and radial wires, and the results showed that, provided a metal sheet was ≮ 4λ in dia., polarization errors as small as 1 deg could be attained. For wire netting screens of the same diameter, a mesh size ≯ 1/12λ was required to attain this performance. (a_1-6, a_2-5, b-1, c-1, d-5, e-474 and 857, f-See earlier Abstract No. 2685)

2784. REDGMENT, P. G., "A Survey of the Problems Involved in the Provision of Radio Aids to Marine Navigation," JIEE, vol. 94, Part IIIA, pp. 1012-1015; March 1947. ABSTRACT: This paper endeavours to show how the mariner's requirements for a navigational aid affect the design of such apparatus by the radio engineer. The classification and requirements laid down at the International Meeting on Radio Aids to Marine Navigation (London, March, 1946) are stated, and in the following Sections the performance required from the various classes is related to the radio frequency chosen, and to the design of the system. The method of presenting the information is next reviewed, and the special problems encountered in marine navigation outlined. The paper then suggests other possible requirements that might modify those laid down at I.M.R.A.M.N. and concludes with a brief review of the main problems facing the designer of a radio navigational aid. (a-1, b-1, c-1, d-5, e-857, f-Survey)

2785. REDGMENT, P. G., STRUSZYNSKI, W., AND PHILLIPS, G. J., "An Analysis of the Performance of Multi-Aerial Adcock Direction-Finding System," JIEE, vol. 94, Part IIIA, pp. 751-761; March 1947. ABSTRACT: This paper presents a theoretical discussion of the performance of crossed fixed-aerial Adcock direction-finder systems employing more than two aerial pairs. Comparison is made with the conventional four-aerial Adcock system, with regard to both spacing error and sensitivity. Improvements are obtained by increasing the total number of aerials over the four of the conventional Adcock system, so that, for a given accuracy, a gain may be achieved either

in frequency coverage or sensitivity, or in both together. It is also shown that an increase in the number of aerials above eight is of little practical advantage, since the spacing for small errors approaches the absolute limit of 1.22λ. A modified system, in which two aerials are connected in parallel to replace each of the single vertical aerials, is also discussed. This system has a performance nearly as good as the fully symmetrical eight-aerial system, and when used in conjunction with a twin-channel receiver it is expected to give the better performance. Finally it is shown that a star connection of the aerials provides a correct sense signal, only when the aerial spacing is less than 0.76λ. (a-1, b-1, c-1, d-5, e-651 and 857, f-Analysis)

2786. REDGMENT, P. G., AND WATSON, D. W., "Very-Long-Wave Phase Differences between Spaced Aerial Systems," JIEE, vol. 94, Part IIIA, pp. 1016-1022; March 1947. ABSTRACT: The paper describes some investigations into the propagation of very-low-frequency radio waves, in which the variations of phase difference between signals received at two points about ten wavelengths apart were measured. Observations were made using two telegraph transmitters on frequencies of 17.2 kc/s and 18.4 kc/s at distances of 1030 km and 5650 km respectively; propagation with ground wave predominate, sky wave only, and both sky and ground wave, was observed. Two sets of measurements were made at each distance, to give an indication of seasonal variations. The results indicated that a navigational aid using these frequencies and a base line of about ten wavelengths would give a probable error of equivalent bearing of less than 0.2 deg near the median line of the system at these distances, and probably at most intermediate distances. Larger variations which were observed at certain times of the night appear to be due to the sunrise or sunset line crossing the propagation path obliquely. An analysis of the periodicity of variations showed that observations would have to be averaged for a period of the order of half an hour to gain any appreciable increase in accuracy. (a-1, b-1, c-1, d-5, e-857, f-Study)

2787. ROSS, W., AND OTHERS, "Discussion on 'Direction-Finding', at the Radiocommunication Convention, 27th March, 1947," JIEE, vol. 94, Part IIIA, pp. 867-870; March 1947. ABSTRACT: Four pages of discussion on paper by Ross concerning various aspects of World War II Radio direction finding including D/F fixes, grouping of HF D/F's, transmitter location, wide apperture D/F, Doppler D/F, Wullenweber D/F, time averaging, short transmissions, re-radiation, ship calibration, U-boat location, German War strategy and other subjects. (a-4, b-1, c-1, d-5, e-857, f-Discussion)

2788. ROSS, M. A., "Fundamental Problems in Radio Direction Finding at High Frequencies (3-30 Mc/s)," JIEE, vol. 94, Part IIIA, pp. 154-165; March 1947. ABSTRACT: The problems of direction-finding at high frequencies may be divided for convenience into three groups, (a) those dealing with the instrument itself, (b) those dealing with phenomena occurring in the course of propagation of the waves, and (c) those concerned with the interpretation of the bearings once the readings have been obtained. As to the instrument, the basic type of high-frequency direction-finder during the past decade has been the Adcock, using spaced vertical aerials. During the war years, attempts were made to improve the performance of the simple Adcock direction-finder by the use of earth mats or arrangements of radial counterpoise wires. Some reduction of polarization error on sites of low conductivity was thereby achieved. There were advances in bearing display, particularly in regard to instantaneous direct-reading types, while improvements in design of components such as receivers and goniometers have resulted in an all-round improvement in the performance of high-frequency ground station direction-finders. To overcome the difficulties of polarization error inherent in Adcock-type direction-finders, several types of practical spaced-loop direction-finders have been developed in recent years. These are all of the rotating coaxial-aerial type. Future improvements in instrumental design are likely to involve a departure from the small-aperture spaced-aerial arrangement, and systems of wide aperture, in which the direction of the wavefront is determined by measurements made at widely separated points are forecast. Reduction of certain types of wave-interference errors, particularly those due to scattering, is likely to be achieved. Recent advances in knowledge of the propagation of waves in the high-frequency band have been concerned chiefly with ionospheric waves. A good deal of information of a statistical nature concerning the deviations suffered by these waves has been accumulated but much still remains to be done, particularly as regards a study of the characteristics and structure of the ionospheric irregularities causing deviations. During the war years various attempts to overcome some of the difficulties encountered when dealing with ionospheric waves were made. Of these, the most important were the ray selection technique (involving apparatus for the selection of a single ray component of a complex signal) and the employment of groups or clusters of direction-finding stations in place of single stations. In the future, the use of instruments of large aperture is likely to cause both of these techniques to be outmoded. Once a bearing from a single direction-finding station or a group of bearings from a network of direction-finding stations has been obtained, there arises the problem of deciding what information is contained in the figures as to the true direction or position of the transmitter. This is the problem of interpretation and it is essentially a statistical one. There are at least two parts to the problem, (a) to determine, a priori, the probable accuracy of the individual bearing or bearings; and (b) with this information to determine the most probable location of the transmitter and establish areas within which there is a given probability of finding the transmitter. The first of these two problems is essentially the more difficult, and though there have been attempts at a solution by various schemes for "classifying" the bearings according to probable errors there is still no fully satisfactory solution. Given a solution of the first, the second problem is mathematically simple, the solution being found in terms of the principle of least squares. In the future, the development of mechanical, electronic or other devices which will carry out the necessary operations automatically is likely to proceed. (a-1, b-1, c-1, d-5, e-471, f-Survey with many references)

2789. ROSS, W., "Site and Path Errors in Short-Wave Direction-Finding," JIEE (London), Part III, vol. 94, pp. 108-114 Discussion, pp. 133-140; March 1947. ABSTRACT NO. 1: Measurements made with 4-aerial Adcock and portable rotating H-type direction finders on sites chosen by visual inspection as good, (i.e., flat and open over at least 1 km^2) showed that the site or path errors varied with the transmitter bearing, frequency (6-15 Mc.) and distance (50-600 meters and 3-16 km) in an entirely random manner through ± 30 and more for the distance transmitters. Ground-wave propagation was assumed throughout. Explanations are given, and it is concluded that a local calibration for supplying a detailed correction curve to observed bearings is not, in general, possible in the short-wave band, but may still be useful when assessing the over-all reliability of a particular installation. ABSTRACT NO. 2: Deals with the results of investigations into the errors observed on wavelengths of 20-50 m. The errors observed on a transmitter at a distance of several miles vary rapidly and erratically with azimuth, wavelength and distance. In some cases a change of bearing of 2-3 deg. has accompanied a change in azimuth of 0.5 deg. or a change of wavelength of only 1%. For two different sites the average numerical error and the (statistical) probable error were roughly proportional to the wavelength. For one site, the probable error on a wavelength of 50 m was 1.7 deg and on 30 m, 0.8 deg. A hypothesis is submitted to explain these results on an assumption that the errors are due to re-radiation from a large number of reflectors scattered at random over a considerable area around the direction-finder. The implications of such a theory are discussed, and it is deduced that for average sites the probable error has a max. value at about 100-150 m. Tests carried out with a portable direction-finder show that even on apparently ideal sites the local errors are not always negligible. (a_1-5, a_2-5, b-1, c-1, d-5, e-441, f-Analysis)

2790. ROSS, W., "The Development and Study of a Practical Spaced-Loop Radio Direction-Finder for High Frequencies," JIEE (London), Part III, vol. 94, pp. 99-107; Discussion, pp. 133-140; March 1947. ABSTRACT NO. 1: The instrument is of the rotating type and uses two single-turn 1-meter square vertical coaxial screened loops 3 meters apart. The field strength required for an arc of silence of ± 5° varies from 1.5 to 4 microvolts per meter for a vertically polarized ground wave between 3 and 15 Mc. The instrument is particularly useful for taking bearings on steeply incident ionospheric waves, where Adcock direction finders are very inaccurate. The polarization error which may be introduced by the essentially nonuniform current distribution along loops is analyzed and discussed. Examples of site errors reducing the accuracy of the instrument are given. ABSTRACT NO. 2: Discusses the principles of design of spaced-loop radio direction-finders and describes a practical instrument embodying these principles. The dimensions of the model are: size of loops, 1 m square; spacing between loops, 3 m. It was designed for the most useful frequency, 3-15 Mc/s. The sensitivity of the instrument is such that for an arc of silence $\not>$ ± 5 deg, the required field strength, for a ground wave varies from 1.5 to 4μV/m throughout the range. The D/F is provided with means of determining the sense of the bearing, operating on novel principles. To obtain high accuracy, care must be taken that the local surroundings of the aerials do not contain features capable of introducing errors and particular attention must be paid to the proper disposition of power or telephone cables. The effects of the essentially nonuniform character of the current distribution in loop aerials are considered. (a_1-6, a_2-2, b-1, c-1, d-5, e-483, f-Study)

2791. ROSS, W., "The Estimation of the Probable Accuracy of High-Frequency Radio Direction-Finding Bearings," JIEE (London), Part IIIA, vol. 94, no. 15, pp. 722-726; 1947. ABSTRACT NO. 1: The method is based on the probable value of the variance associated with

the observation. Snap bearings are taken over a period of five minutes. The arithmetic mean is taken as the observational bearing. The probable variance is estimated from (a) the spread of the observed readings, (b) site errors based on the past history of the direction finder, (c) the ionospheric lateral deviation based on known data, and (d) the observational error based on the flatness of the bearing. In a practical trial of the method, good agreement was obtained between the estimated and the actual bearing errors. ABSTRACT NO. 2: The method described is based on the estimation of the probable value of the standard deviation or variance to be associated with the observation. The bearing observations must be made according to a prescribed form, which consists in taking about 10 "snap" readings of the bearing spread over about 5 min. The arithmetic mean of this group of bearings is taken as the observation, and the scatter or spread of the readings in the group provides one of the quantities necessary for the estimation of the probable variance. Other components entering into the estimation of the variance are (a) site error component based on past history of the direction-finder, (b) ionospheric later deviation component based on known data, and (c) observational error component based on the quality (i.e., flatness) of the min. In a practical trial, good agreement was obtained between estimated and actual bearing errors. A check applied at the 90% probability level showed that 85-90% of the bearings had their variance correctly estimated. (a_1-6, a_2-2, b-1, c-1, d-5, e-857, f Description)

2792. SMALE, J. A., "Some Developments in Commercial Point-to-Point Radiotelegraphy," JIEE, vol. 94, Part IIIA, pp. 345-367; March 1947. ABSTRACT: Developments in point-to-point radiotelegraphy have been concerned chiefly with the improvement of reliability to facilitate the introduction of time-division multiplex systems using direct-printing equipment, and to ensure continuous communication over difficult circuits such as those to the antipodes. Methods of reception using frequency-shift keying are discussed in relation to distortion, interference and multi-path effects; figures are given for the results of tests with this system compared with those of the on/off keying system. In one case, the lost capacity due to poor radio conditions was reduced by 39%. Radiotelegraph relays are described which cover interruption of direction communication, and charts are included to show the recovery of lost time. Owing to the introduction of radio relay stations at Barbados and Colombo, the periods when no communication is possible between this country and Australia have been reduced to negligible proportions. The effects of ionospheric disturbances on the London-Montreal route have also been greatly reduced by the use of radio relay stations at Ascension and Bardados; the station at Ascension has been in use since 1939. Equivalent phase modulation of short-wave transmitters is discussed or use with long-distance facsimile circuits. Concerning aerials, the development of horizontal-dipole receiving arrays to augment the vertical broadside-beam array, is dealt with; also a review of wideband coupling devices for coupling balanced aerials to coaxial feeders. Mention is made of the advantages of remotely controlled and unattended radio transmitters in reducing congestion on radio-station sites and in minimising personnel. The paper also deals with telegraph printing systems; the double-current cable-code system is described, and compared with 5- and 7-unit systems for undetectable errors and flexibility of operation. A frequency-modulated VF system for the control of radio stations is described. Finally, under the general heading of miscellaneous telegraph equipment, the paper contains a description of a high-speed photo-electric morse transmitter and an electronic keying device. (a-1, b-1, c-1, d-5, e-857, f-Survey and review)

2793. SMITH-ROSE, R. L. AND ROSS, W., "The Use of Earth Mats to Reduce the Polarization Error of U-Type Adcock Direction-Finders," JIEE (London), Part III, vol. 94, pp. 91-98; Discussion, pp. 133-140; March 1947. ABSTRACT NO. 1: Polarization errors introduced by the buried horizontal feeders of a 4-aerial U-type Adcock direction finder were found to be greatly reduced between 3 and 10 Mc. by an earthed wire mat of 0.6-meter square mesh 31 meters in diameter (about 5 times the aerial spacing) laid symmetrically around the aerial system on or near the ground. Earthing the mat was found to be essential; on high-conductivity ground direct earth connections could be used, but on low-conductivity ground it was necessary to connect sets of radial-wire extension of various lengths to the mat, each set resonating roughly independently of the others to provide a low-impedance path to earth for the periphery of the mat at various frequencies between 3 and 10 Mc. Provided that the feeders were not too large in diameter and were bounded to the mat, it was found unnecessary to bury them. The polarization error, besides being considerably reduced, should be more independent of weather conditions and therefore more accurately predictable. ABSTRACT NO. 2: The error arises from signal voltages introduced by the horizontally polarized component of the incident wave, when the feeders are in or upon ground of low conductivity. An earth mat 31 m dia. makes little difference on highly conductive ground. By adding radial wires of 3 lengths resonating at 3 points within the band a significant improvement is obtained; even on ground of very low conductivity accurate bearings are then obtained. (a_1-6, a_2-5, b-1, c-1, d-5, e-475, f-Analysis)

2794. STANSFIELD, R. G., "Statistical Theory of d.f. Fixing," JIEE, vol. 94, Part IIIA, no. 15, pp. 762-770; March 1947. ABSTRACT: Deals with the location of an object of unknown position, on which bearings are taken from two or more stations whose positions are known, and provides solutions to the two problems: (a) Given a set of bearings, what is the most probably position of the object? (b) How far from the true position is the position indicated by the "fix" likely to be? Diagrams show the results of applying the theory to practical cases. It is shown that, subject to certain qualifications, reliability of a "fix" does not depend on the size of the particular "cocked hat" from which it is derived. It is proposed that the reciprocal of the rms error expected in the position of the "fix" should be adopted as the conventional standard quantity for measuring the reliability of a "fix." (a-1, b-1, c-1, d-5, e-857, f-Theory)

2795. STRUSZYNSKI, W., ROBUS, E. G., AND WOOLLEY, J. C., "An Instrument for Measuring the Resonant Frequency of Reradiating Structures," JIEE, vol. 94, Part IIIA, pp. 741-750; 1947. ABSTRACT: The circuit theory of an instrument for measuring the resonant frequencies of reradiating structures is analysed in detail, and conditions for its proper working are formulated. The development of the instrument, its circuit and performance, are described. Various applications of the instrument are given, such as the measurement of resonant frequencies of earthed structures, and of loop and transmission-line circuits, and "balancing" of the sense-aerial system of high-frequency direction-finding installations on board ship. Some examples of practical measurements are also given, and the limitations of the instrument are stated. (a-1, b-1, c-1, d-5, e-857, f-Analysis)

2796. STRUSZYNSKI, W., AND MARSHALL, J. H., "An Investigation of Symmetrical Screened Transformers for H. F. Radio Direction-Finders," JIEE, vol. 94, Part IIIA, pp. 857-867; March 1943. ABSTRACT: The purpose of a symmetrical screened transformer for application to H/F direction-finding is pointed out, and the requirements are stated. Equivalent circuit theory for symmetrical screened transformers is given, and the symmetry factor defined. Methods of balancing are described. Experimental evidence in support of the theory is provided, and the principles of mechanical design are discussed. Results of measurements of the symmetry factor on two typical transformers are given .... In rf Technique, especially in direction-finding, it is often necessary to couple a balanced circuit (such as a balanced aerial or transmission line) to an unbalanced circuit, in such a way that the following conditions are satisfied: (a) the "symmetry" of the balanced circuit is maintained. (b) The transfer of energy of "antenna currents" (see Fig. 1) from the balanced primary circuit to the secondary is as small as possible. The transformer to be used for this purpose should have an electrostatic screen, and be constructed in a symmetrical manner. Such a transformer will be referred to in this paper as a "symmetrical screened transformer." This type of transformer is also used to couple two balanced circuits so as to satisfy condition (b). An electrical circuit is balanced if it can be considered as being composed of two electrically identical parts, connected between the mid-points of input and output. This electrical identity is characterized by the fact that, between any two points the one part of the circuit, there is the same impedance as between the two corresponding points of the other part. This applies also to the impedances to earth from corresponding points of each part. A balanced circuit can be energized in two ways: (a) By a "loop emf" producing "loop currents," whose phases differ by 180° at corresponding points of the two parts of the circuits. The voltage distribution at any frequency is then such that corresponding points of the two parts of the circuit have equal and opposite potentials to earth, and the mid-points of the input and output elements of the circuit are at earth potential. (b) By an "antenna emf" producing "antenna currents" which are of the same phase at corresponding points of the two parts of the circuits. The voltage distribution at any frequency is therefore such that corresponding points of the two parts of the circuit have the same potential. The mid-point of input and output may, if not earthed, have a certain potential to earth. (a-1, b-1, c-1, d-5, e-800, f-Theory)

2797. TERMAN, F. E., AND PETTIT, J. M., "Correction to: 'The Compensated-Loop Direction Finder'," Proc. IRE, vol. 35, p. 269; March 1947. ABSTRACT: Joseph M. Pettit has drawn attention to the editors of certain mathematical errors appearing in the original article and amends them in this issue. See: Original Abstract No. 2290. (a-4, b-1, c-1, d-1, e-665, f-Theory)

2798. TREMELLEN, K. W., AND COX, J. W., "The Influence of

Wave Propagation on the Planning of Short-Wave Communication," JIEE, vol. 94, Part IIIA, pp. 200-219; March 1947. ABSTRACT: This paper deals with the path from transmitter to receiver as it affects communication on frequencies of 2-30 Mc/s, and describes the war-time practice of the Interservices Ionosphere Bureau (I.S.I.B.). In this band the chief factor is the ionosphere. Methods of exploration of the ionosphere are discussed, especially with regard to obtaining data applicable to communications. Mention is made of the great expansion in the number of ionosphere observatories during the war, and on the basis of this new knowledge, methods of predicting ionosphere characteristics are described, with examples. From a communication point of view, a transmission path via the ionosphere behaves as a band-pass filter introducing noise and distortion as well as attenuation, and modern methods of calculating the frequency limits and the properties in the pass-band are given, with typical examples. Predictions are made for mean values, and deviations from the mean are also considered, including the effects of magnetic storms. The war-time service of prediction of magnetic storms, given by the authors from I.S.I.B., is described in outline. Attention is directed to some of the main points in need of further elucidation, such as attenuation and noise, and the method of production of the ionosphere. (a-1, b-1, c-1, d-5, e-857, f-Analysis)

2799. UMPLEBY, K. F., "Airborne Automatic Direction-Finders," JIEE, Part IIIA, vol. 94, no. 15, pp. 693-704; March 1947. ABSTRACT NO. 1: Discussion of the general principles of direction finders which automatically rotate their loops to the null position; three such systems are described. The American AN/ARN7 radio compass uses an iron-cored loop which is driven by a 2-phase motor supplied from a saturable-core transformer. The saturation is controlled through thyratrons, by the receiver output. The German Peilgerat VI system also uses an iron-cored loop, driven by a dc motor which is controlled, through a Ward-Leonard system and vibrator rectifier, by the receiver output. In the Royal Aircraft Establishment (R.A.E.) direction finder now being developed, the iron-cored loop is driven, through a differential gear, by two continuously running motors. The loop is rotated when the motor speeds differ; static friction is thus eliminated. ABSTRACT NO. 2: Discusses the use, in aircraft, of automatic direct ion - finders of the switched-cardioid type. Operating principles are described, and the underlying design considerations are dealt with. Representative examples of German and American origin, used widely during the war, are described, and reference is made to a new equipment being developed. ABSTRACT NO. 3: The paper is concerned with the use, in aircraft, of automatic direction finders of the switched-cardioid type. Operating principles are described, and the underlying design considerations are dealt with. Representative examples of German and American origin, used widely during the war, are described, and reference is made to a new equipment being developed. A section is devoted to new developments in connection with iron cored loops, and cathode followers for coupling the loop to the receiver. The more general aspects of continuous-wave (C.W.) direction-finding are treated only to the extent necessary to ensure completeness. (a_1-6, a_2-5, a_3-1, b-1, c-1, d-5, e-857, f-Discussion)

2800. DE WALDEN, S., ROCKE, A. F. L., BARRETT, J. O. G., AND PITTS, W. J., "The Development of a High-Frequency Cathode-Ray Direction-Finder for Naval Use," JIEE (London), Part IIIA, vol. 94, no. 15, pp. 823-837; March 1947. ABSTRACT NO. 1: The operation of the latest design of shipborne equipment for the frequency range 1 to 24 Mc is based on the familiar twin-channel principle. A crossed-loop antenna system is used and sense is determined by causing the output from an omnidirectional antenna to black out one end of the cathode-ray-tube trace. Development problems associated with the balance of the twin amplifiers, the simplification of alignment and operation and the visual presentation of sense are discussed. The performance under operational conditions is described. ABSTRACT NO. 2: The operation of the direction-finder described in this paper is based on the familiar principle by which two balanced amplifiers, connected to Bellini-Tosi crossed loops, operate the appropriate deflecting plates of a cathode-ray tube. The bearing is displayed as a trace on the c.r.t. fluorescent screen, providing a direct instantaneous reading. The sense of the bearing is obtained by combining the signals from an omni-directional sense aerial with the signal from either of the loops. The sense signal modulates the intensity of the electron beam, which is being swept, either vertically or horizontally, by the signal provided by the respective loop. The relative phase of the two signals is such that one or other end of the fluorescent trace is blacked out, depending upon which of the two lobes of the figure-of-eight loop characteristic is effective for a given wave-direction. The first experimental equipment, designed for surface vessels, was already in operational use at the end of 1941, but the development proceeded until 1944, when the equipment reached its final form. With small modifications the same equipment was adopted for use at naval shore-stations, operating with an Adcock aerial system. The paper describes the latest design of the shipborne equipment and also discusses, more generally, some of the problems of the twin-channel receiving technique encountered during the development. (a_1-6, a_2-1, b-1, c-1, d-5, e-857, f-Summary)

2801. WHELPTON, R. V., AND OTHERS, "Discussion on C.W. Navigational Aids," JIEE, vol. 94, Part IIIA, pp. 1022-1030; March 1947. ABSTRACT: A lengthy discussion on referenced papers by Whelpton and Redgment pertaining to C.W. navigational aids. It includes comments on direction finding. (a-4, b-1, c-1, d-5, e-857, f-Discussion)

2802. WHELPTON, R. V., AND REDGMENT, P. G., "The Development of C.W. Radio Navigation Aids, with Particular Reference to Long-Range Operation," JIEE, vol. 94, Part IIIA, pp. 244-254; March 1947. ABSTRACT: The paper analyses the factors which affect the reliability and accuracy of radio aids to navigation at long ranges. After a brief discussion of the propagation of radio waves likely to be useful for this purpose and some suggestions regarding the best choice of frequency, brief descriptions of various techniques for position fixing with the help of radio waves are given. Pulse modulator is not discussed, except in the final Section of the paper which gives the authors' views of the advantages and disadvantages of all known radio navigation systems with particular reference to long-range operation. (a-1, b-1, c-1, d-5, e-857, f-Analysis)

2803. KEERAN, R. V., AND FISKE, P. E., "Semiautomatic Recorder for Radio Direction Finder Calibration," USN, NEL: 2; 13 March 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2804. BENOIT, R. C., AND BIRNBAUM, I., "Direction Finder Assembly AN/CRA-1," Army Air Force, Watson, Engineering Division, Report No. 33; 15 March 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2805. ANONYMOUS, "Long-Range Radio Navigation Aids. I--Cathode Ray Direction Finding and the Automatic Radio Compass," Aeroplane, vol. 72, no. 1867, pp. 277/280-282; 21 March 1947. ABSTRACT: Following a discussion of the frequency bands desirable for short- and long-range navigation, consideration is given to the operating principles of cathode ray direction-finding equipment for ground stations and to the automatic radio compass for aircraft. (a-2, b-2, c-1, d-1, e-0, f-Survey and RDF principles)

2806. ANONYMOUS, "Automatic Radio Direction Finder (Radio-Compass) Model SCR-269F," USN, Naval Air Station, Lakehurst, Report No. KM-33 TIP:315 D-9; 27 March 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2807. ANONYMOUS, "Bibliography of British Reports on Radio Navigation and Direction-Finding Beaconry and Identification," Ministry of Aircraft Production; British Commonwealth Scientific Office, Washington, D. C., Report No. 100-8-355/47; April 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Bibliography)

2808. ARDITI, M., CAPAN, N., AND DE ROSA, L., "Report on Study of Electronic Direction Finding Techniques," Federal Telecommunications Laboratory, Nutley, New Jersey, Progress Reports No. 1 through 5; August 1946 to April 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2809. HARMENING, "Comparative Measurements on an Umbrella Antenna and on a Bent Marconi Antenna," Army Air Force; Translation (T-2) No. 1090; ZWB FB 732, Translation. See also Department of Commerce PB L19981-T; April 1947. ABSTRACT: This is a translation of original document contained in file, Department of Commerce Publication PB19981. (a-4, b-3, c-1, d-4, e-0, f-Translation)

2810. KAULE, H., "Basic Investigations on the Question of Frequency Direction Finding," Army Air Force, Wright Field, Dayton, Ohio, Translation No. F-TS-914-RE; April 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-0, e-0, f-Translation)

2811. LEE, J. M., LAHR, B. M., AND PALMER, R. G., "Investigation of Site Requirements for Very-High-Frequency Radio Ranges," U. S. Civ. Aeronautics Administration - Tech Development Note No.

45, p. 59; April 1947. ABSTRACT: Results of extensive flight tests on two course visual radio range operating on frequency of 125.4 mc; objective was to determine effect of buildings, trees and telephone or power lines on range courses and to establish from these results, site requirements for future installations. (a-3, b-3, c-1, d-1, e-0, f-Site specifications study)

2812. MC GILLIVARY, J. A., "Safety in Air - User's Views on Radio Aids," Wireless World, vol. 53, no. 4, pp. 146-149; 4 April 1947. ABSTRACT: Brief review and evaluation of various systems proposed and in use for facilitating air navigation; notes include Decca System, Consol, Loran, Gee, O.R.B. (Omni-directional Radio Beacon), B.A.B.S. (Beam Approach Beacon System), S.B.A. (Standard Beam Approach), and I.L.S. (Instrument Landing System), as well as various combinations of these. (a-3, b-1, c-1, d-5, e-0, f-Survey)

2813. OCKENDEN, C. V., "Sferics," Met. Mag., vol. 76, pp. 78-84; April 1947. ABSTRACT: With four stations operating cathode-ray-tube direction-finding equipment at a frequency of about 10 kc, the British Meteorological Office is able to hear and locate thunderstorms at distances up to 1,000 to 1,500 miles. The equipment is briefly discussed, and results for certain specific days are correlated with other synoptic information. (a-3, b-2, c-1, d-5, e-0, f-Sferics)

2814. ROUBINE, E., "Recent Theories of the Aerial: Part 4," Onde Elec., vol. 27, pp. 160-169; April 1947. ABSTRACT: Outlines are given of a symbolic method for the intregration of the Hallen equation and of the methods of King, Blake, and Harrison, and also of the modifications of Hallen's theory suggested by Miss Gray in 1944. It is impossible to determine the best of the theories, owing to the difficulty of measuring input impedance accurately. (a-6 and 4, b-1, c-3, d-3, e-0, f-Theory)

2815. SOMMERFELD, A., AND RENNER, F., "Radiation Energy and Ground Absorption of Dipole Antennas," Air Materiel Command T-2 Report No. F-TS-1071-RE; April 1947 ABSTRACT: The various factors that affect the total strength of radio waves radiated from a Hertz antenna, either vertical or horizontal, are mathematically presented. Relationship between total energy value of the antenna system and elevation above ground are conveniently expressed by general formulas and are graphically explained. Practical radiation problems dealing with vertical dipoles are solved by means of simple functions without applying Bessel functions. The effect of refraction and reflection upon radiation is considered in calculations. The conducting properties of the ground have a direct bearing on the strength of the waves. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

2816. TOLLER-BOND, D. H., "Decca Navigator System," Naut. Gaz., vol. 141, no. 4, pp. 17-23, 35; 4 April 1947. ABSTRACT: Originally conceived by William O'Brien, Chicago engineer, system was developed during World War II by Decca Navigator Co., London, in conjunction with British Admiralty, and used for first time in Normandy invasion: technical consideration of system which has range of 600 mi by day and 300 mi by night. (a-3, b-2, c-1, d-1, e-0, f-Summary)

2817. WATSON, J.M.S., "A Portable Direction Finding Receiver," R.S.G.B. Bull., vol. 22, pp. 161-164; April 1947. ABSTRACT: Describes equipment for operation in the 1.7 Mc. Band. (a-4, b-1, c-1, d-0, e-0, f-Description)

2818. NAVAL RESEARCH LABORATORY, "Bibliography of NRL Published Reports October 1933 - March 1947. Supplement No. 1, April 1947 to February 1948. Supplement No. 2, February 1948 to September 1948," NRL Report 3085; 1 April 1947. ABSTRACT: The Bibliography of Naval Research Laboratory Reports lists chronologically all scientific and technical published and bound reports issued by the Laboratory. The number, title of the report, and its classification are included. The first published and bound NRL report, dated 2 October 1933, was arbitrarily given the number 1000. To date the number of such reports issued has reached 3069. In numbering each report a preceding letter was assigned to indicate the scientific division in which the report was prepared. The key to these letter identifications is as follows: (B) - Interior Communications, (E) - Electricity, (H) - Heat and Light (now Optics), (M) - Metallurgy, (O) - Ordance (now Physics), (P) - Physical Chemistry (now Chemistry), (R) - Radio, (S) - Sound, (V) - Shock and Vibration. A complete file of these reports is maintained at the Laboratory but the supply of most of the reports published prior to 1940 is temporarily exhausted. Attention may be called to the fact that this first publication of the Bibliography, while reasonably complete, is a preliminary compilation, and intended for the convenience of the Laboratory personnel until a more finished listing can be published. In the matter of declassification of reports, it is believed that all such changes to date are included. A number of reports, however, are presently under consideration for declassification, and other reviews will be undertaken in the future. (a-1, b-3, c-1, d-1, e-192 f-Bibliography)

2819. ANONYMOUS, "Radio - Countermeasures - Comparative Intercept Effectiveness of DBM-1 Direction Finder Collectors and Search Antennas AT-37/APT and AS-26/APR-2, Final Report on - Problem S1063T-C - Radio Division II," USN, NRL Letter Report No. C-S67/69(1245C) C-1240-34/47; 3 April 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2820. ANONYMOUS, "Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 5; 4 April to 27 June 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2821. HARRIS, F., "Radio - Direction Finders - Model DAU Loop - Type Test of, Radio Div. II," USN, NRL Letter Report No. 1240-55/47 S67/69; 28 April 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

2822. ANONYMOUS, "Complete Mechanical Description of a German Training Device for Navigation by Radio Direction Finding Apparatus," U.S. Office of Naval Research, Sands Point Laboratory, Port Washington, New York. See Department of Commerce PB92170; May 1947. ABSTRACT: Report contains 32 pages including diagrams and drawings. Subjects covered in report are German radio direction finders and navigation training devices among other related items. (a-4, b-3, c-0, d-4, e-0, f-Trainer description)

2823. ADDISON, E. B., "The War in the Ether," Jour. Roy. Aero. Soc., vol. 51, pp. 425-436; Disc., pp. 436-439; May 1947. ABSTRACT: A lecture dealing mainly with the use of radio as a weapon, and the tactics evolved to use it in the defense of Britain and in the protection of our bombers when attacking targets in enemy territory. (a-6, b-1, c-1, d-5, e-0, f-Survey)

2824. BROWDER, J. E., AND YOUNG, V. J., "Design Values for Loop-Antenna Input Circuits," Proc. IRE, vol. 35, pp. 519-525; May 1947. ABSTRACT NO. 1: A theoretical treatment of the problem leading up to formulas and charts for the choice of inductances, Q values and coupling coefficients of loop-aerial coupling transformers for obtaining optimum signal-to-noise ratio. The case of cable connection of the loop to the receiver is also considered. ABSTRACT NO. 2: Design formulae and charts for the choice of inductances, Q's, and coupling coefficients of loop-aerial coupling transformers are given on the basis of signal/noise characteristics. A method of determining these values when a cable or other primary capacitance is present is given. (a_1-5, a_2-2, b-1, c-1, c-1, e-0, f-Theoretical investigation)

2825. BURGESS, R. E., "Partially-Screened Open Aerials," Wireless Eng., vol. 24, pp. 145-149; May 1947. ABSTRACT: A simple approximate theory based on the transmission-line equations is developed for an open aerial, a portion of which is enclosed in a concentric conducting screen. The voltage and current distributions in the transmitting case are deduced. From these the effective heights of the "screened" and unscreened portions of the aerial are calculated and it is found that as the length of the unscreened portions increases so the effective height of the screen portion tends to equality with its length, as was first demonstrated experimentally by Smith-Rose and Barfield. The susceptance of the aerial is calculated on the assumption of no losses and it is found that the antiresonant frequencies are displaced by the presence of the screens while the resonant frequencies occur when the length of the inner conductor or of the screen is equal to an odd number of quarter-wavelengths. A simple equivalent circuit is given for an aerial which is short compared with the wavelength. (a-1, b-1, c-1, d-5, e-0, f-Theory)

2826. KING, D. D., "Impedance Measurement on Transmission Lines," Proc. IRE, vol. 35, pp. 509-514; May 1947. ABSTRACT: A derivation of the formulas available for the measurement of terminal impedances on transmission lines is given in terms of hyperbolic functions. The accuracy and usefulness of a number of different methods are considered. Results are obtained in a form suitable for convenient

application to practical measuring problems involving standing-wave and resonance-curve methods. (a-1, b-1, c-1, d-1, e-0, f-Theory)

2827. STUETZER, O., "A Broad Band Antenna of Changeable Radiation Pattern for Centimeter Waves," U. S. Army Air Force, Translation No. F-TS-1120-RE; May 1947. ABSTRACT NO. 1: A translation from the original treatise written probably in German in July 1941. The report consists of eight pages of design notes on an antenna with uniform output impedance over a broad band and an adjustable radiation pattern. ABSTRACT NO. 2: The designing of a funnel-shaped antenna with equal input impedance over a broad band was undertaken. The design of the antenna is described and its operation explained. With funnel-shaped radiators, amplitude distribution in the mouth of the horn is not constant, but approximately sinusoidal. Theory and experiment show that side lobes of the radiation pattern become very small. In general, the transmitter will work the antenna by means of a line. A rectangular wave guide may be conveniently used. One dimension of its cross section is to be a little smaller than half the smallest wavelength applied, the perpendicular dimension about 0.7 times the longest wavelength. The transition from line to funnel must be tapered a "rounding radius" of about three wavelengths. The greatest advantage of the given design is that it is not critical. (a_1-4, a_2-3, b-3, c-1, d-4, e-0, f-Description)

2828. ANONYMOUS, "Service Test of AN/ARN-6 Radio Compass," Army Air Force, Elgin Field, Report No. E-45-48; 13 May 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

2829. LORENZ, L., "Flush-Mounted ADF Loop and Sense Antenna," Industrial Electronics Research, Incoroporated, Detroit, Michigan, Report No. N-1200-2; 21 May 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2830. BAILEY, R. H., "4-Band Automatic Radio Direction Finder for Transport Planes," Radio News, vol. 37, no. 6, pp. 68-69/130; June 1947. ABSTRACT: An account of a new light-weight radio compass covering all normal broadcast transmissions and marine beacons. Improved bearings are obtained because the compass loop is automatically turned to face the incoming signal. High altitude and atmosphere effects are reduced by hermetic sealing of components and eliminating the receiver power pack. (a-6, b-2, c-1, d-1, e-0, f-Description)

2831. BAREFORD, C.F., TRIER, P.E., AND GODDARD, N.E., "A Naval Centimetric Wave Direction Finder," Admiralty Signal Establishment (British) Report No. M.804; June 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

2832. BRODZINSKY, A., TIMM, R.S., AND WINNICK, A.B., "Investigation of Direction Finders for 200-400Mc/s," USN, NRL Report No. R-3092; ASTIA No. AD-45424; June 1947. ABSTRACT NO. 1: This report covers the first portion of an investigation of airborne direction-finding systems in the 200- to 400-mc/s frequency range. Of the various components of such systems, the directional collector or antenna is shown to be the most critical and difficult component to realize. Several collector-types are considered, and from these the loop-types and the reflector-dipole types are considered the most promising as practical directional collectors for aircraft in the given frequency band. A new means is described for efficiently employing a loop over bands of at least one octave whereby the loop impedance is fully utilized as one component of a broadband filter network. The results obtained for a loop so designed and for a reflector-dipole antenna are presented. These results indicate that it is feasible to design an airborne direction-finding or homing equipment in the 200- to 400-mc/s frequency band. It is pointed out that these laboratory results dealing with equipment investigations may be seriously compromised in an actual airborne installation by the Environment Effects of the aircraft. ABSTRACT NO. 2: Upon the request of BuShips, NRL has undertaken the investigation of navigational direction-finding systems in the frequency range from 200 to 400 mc/s, in order to make a comparison of existing or proposed systems, to evaluate their application to airborne equipment, and to submit a detailed proposal on a uhf radio direction finder for airborne application in carrier and patrol craft. This report covers the results thus far accomplished on the problem, and includes the direction of further investigation based on some newly developed principles of operation. In order that the developed equipment might conform to service conditions, and to reduce the burden of development, the following restrictions were imposed on the design: (a) The system shall be designed to intercept and D/F on electromagnetic radiation in the 200-400 mc/s band for both D/F and homing purposes. (b) The system shall be designed for installation in any naval aircraft and shall be complete in itself with the exception of the receiver portion of the circuit. (c) Relative azimuth over a spatial coverage of 360° shall be provided. (d) The equipment, except for the receiver portion, shall not weigh more than 25 pounds. Subsequent conferences between Bureau of Aeronautics, Bureau of Ships, Chief of Naval Operations, and the Naval Research Laboratory on the desired military characteristics of a Naval aircraft homing system have enumerated other desirable characteristics which, though not mandatorily imposed, have been consciously considered in the investigation. Some of the more important of these characteristics are: (a) The system shall be primarily an auxiliary homing system to provide sufficient bearing information for the safe return of Naval aircraft to a base or ship within normal operating range. (b) With primary consideration to weight, space, and complexity, full azimuthal coverage and distance information are desirable in addition to homing data. (c) An independent system is desired, but dependence on installed equipments should be considered if a material saving in weight and complexity can be realized. (d) A maximum of 10 pounds for the aircraft units may be considered a target weight. From the operation and performance standpoint, a highly desirable direction finder for uhf would be a scaled-up-frequency version of the medium-frequency automatic direction finder of the AN/ARN-6 type. This system combines automatic D/F homing, and communication in one equipment whose operation is very simple. (a_1-1, a_2-1, b-3, c-1, d-1, e-866, f-Study)

2833. BUSIGNIES, H., AND DISHAL, M., "Relations between Bandwidth, Speed of Indication, and Signal-to-Noise Ratio in Radio Navigation and Direction Finding," Elec. Commun. (London), vol. 24, pp. 264-265; June 1947. ABSTRACT: Summary of IRE Convention paper. For signal-to-noise ratios of the order of 3 to 1, the signal required for a given signal-to-noise ratio is proportional to the square root of the bandwidth ratio for pre-detection narrowing and to its fourth root for post-detection narrowing. A possible new bucking detector method for reproducing signals at very low signal-to-impulse-noise ratios is described. The required speed of indication for various aids to navigation are considered, and it is suggested that unnecessarily wide bandwidth is used in some of them. The navaglobe narrow-band automatic direction-finding system, which has 20 cps pass-bandwidth, is described. (a-6, b-1, c-1, d-5, e-49, f-Discussion)

2834. CHRISTIANSEN, W. N., "An Exponential Transmission Line Employing Straight Conductors," Proc. IRE, vol. 35, pp. 576-581; June 1947. ABSTRACT NO. 1: The design is described of a 4-wire wideband matching line, of constant wire diameter, in which the horizontal and vertical wire spacings vary linearly with distance to produce a characteristic impedance which rises nearly exponentially from 300 to 600 ohms. ABSTRACT NO. 2: It is shown that a four-wire line may be designed to provide a very close approximation to an exponential line in the range of impedances from 300 to 600 ohms. Test results indicate that a satisfactory impedance transformation may be obtained with such a line. The employment of a single size of conductor throughout, the absence of elaborate shaping and the convenient physical dimensions are the useful features of the line. It has particular application to the problem of supplying power to multiple rhombic or other aperiodic antennas. Design equations and charts are presented which aid in determining the wire sizes, values of taper, and the change in taper for building some of these transformers. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Description)

2835. CLARK, T. H., "Investigation of Errors in Spaced-Collector Direction-Finder Systems," Elec. Commun., (London), vol. 24, pp. 199-207; June 1947. ABSTRACT: Site errors are classified but not investigated. Errors resulting from the design of one directional pair are considered for a wave arriving in the horizontal plane. These are treated mathematically and general conclusions, applicable as specific design principles, are drawn. Errors due to the combination of two directional pairs are investigated generally as are errors resulting from the use of long cables connecting the aerials to the goniometer. Finally, possible errors due to faulty alignment of the mechanical parts of the goniometer are mentioned. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

2836. COLIN, R. I., "Survey of Radio Navigational Aids," Electrical Communications, vol. 24, no. 2, pp. 219-261; June 1947. (Reprinted by Federal Telecommunications Laboratories, Nutley, New Jersey). ABSTRACT: A survey based upon the following outline: (1) Introduction; dead-reckoning versus radio methods; (2) Directional Receiving Systems: general principle, airborne direction finding, ground direction finding, direction finding versus range or track systems; (3) Absolute-Distance Systems: general principle, pulse method, timing principles, responder-beacons, phase- and frequency-modulation methods, radar principle (PPI display); (4) Differential-Distance Systems: general principle, pulse method (Loran, Gee), phase method (Decca, Raydist); (5) Directional Transmitting Systems: general principle, limited-

coverage ranges (A-N range, landing beam), intermediate coverage ranges (Consol, Sonne), Omnidirectional ranges (Navaglobe, CAA Omni-range); (6) Ambiguities: general nature, directional systems, pulse-distance systems, phase-distance systems; (7) General Navigation Requirements: types of information, reliability, accuracy, presentation, independence; (8) Short-Range Applications: radio altimeters (TCI), landing-system requirements, instrument landing systems (ILS), ground-controlled approach (GCA), radio mileposts (Marker Beacons); (9) Medium Range Applications: general requirements, distance indicators (DME), radar for navigation and anticollision, rotating-beacon principle (Orfordness Range), Navar principles, automatic position plotting (APP), relayed radar (Teleran, Navascope); (10) Long-Range Applications: general requirements, distance requirements, differential distance versus directional transmitting, propagation problems, specific systems; (11) Conclusion. (a-4, b-1, c-1, d-1, e-60, f-Reference survey)

2837. FALTA, W., "Radio Navigation Method 'Egon'," U.S. Army Air Force Translation No. F-TS-2634-RE; June 1947. ABSTRACT: Translation believed to be from German, consisting of 31 pages which describes the above ground control method of air navigation. The ground control of the course of the aircraft is accomplished by a radar identification signal transmitted from the airplane and intercepted by a ground station. Plotting, navigation, course correction, and fire control are done at the ground station and transmitted to the pilot by uhf radio. The range of accuracy is about ± 200 m. and the azimuth accuracy about ± 0.3°. (a-4, b-3, c-1, d-4, e-0, f-Description)

2838. GRIFFITHS, H. V., "Doppler Effect in Propagation," Wire. Eng. pp. 162-167; June 1947. ABSTRACT: Presented are simple mathematical and trigonometric calculations relative to Doppler effect that exist when source of radiation and the observer are in motion. The Doppler effect has been observed with radio waves reflected from rockets. It caused a detectable heterodyne or difference frequency between the waves arriving by the different paths. It is noted that the equations for moving radiation sources and moving observers, although similar, are not identical. (a-3, b-2, c-1, d-5, e-0, f-Doppler effect)

2839. HASTINGS, C. D., "Raydist - A Radio Navigation and Tracking System," Tele-Tech., vol. 6, pp. 30-33, 100-103; June 1947. ABSTRACT NO. 1: A portable system depending on the relative phase relationship between cw transmitters operating on frequencies of the order of 2 to 15 Mc. Block diagrams show the arrangement of equipment at the master and relay stations for (a) determing the position of a ship or an aeroplane, (b) measuring the distance between two stations, and (c) charting the flight path of a guided missile. ABSTRACT NO. 2: Since undergoing intensive development, the Raydist has become a precise navigation and tracking system, and a means for surveying over water and rough terrain. The application of the heterodyne principle to a Doppler system results in considerable simplification of the apparatus and an increase in accuracy over systems not employing this principle. The Raydist is a continuous-wave system, dependent on the relative phase relationship between continuous-wave radio transmitters. By use of a high-quality crystal-controlled transmitter, the accuracy is limited only by consistency of radio propagation phenomena. The Raydist system measures relatively short distances accurately, but is also capable of precise measurements of long distances and is not limited to line-of-sight. It may be set up as a hyperbolic line-of-position system or as a pure range system to measure the straight-line distance between a portable unit and a single fixed ground station. (a_1-6, a_2-3, b-1, c-1, d-1, e-0, f-Description)

2840. RICHARDSON, A.G., LARSSEN, L., AND CHESUS, F.O., "AN/CRD-6 D.F. Equipment," Federal Telephone and Radio Corporation, Newark, New Jersey; June 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2841. SHULMAN, J.M., "A Method of Automatic Radio Direction Finding at Very High Frequencies," University of California, Thesis; June 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

2842. RADIO DIRECTION-FINDING RESEARCH GROUP, "Bibliography of Published Articles on Radio Direction Finding," Department of Electrical Engineering, University of Illinois, Urbana, Illinois, Technical Report No. 1, (Office of Naval Research Contract: N6-ori-71, Task Order No. 15); 1 June 1947. ABSTRACT: This bibliography is a comprehensive listing of published articles pertaining to radio direction finding. Use of the bibliography in Wireless Direction Finding, by R. Kean is included and is acknowledged. The bibliography is indexed and grouped according to subject matter, and listings therein are chronologically cited. It is estimated that the individual listings number in excess of 700. (a-4, b-3, c-1, d-1, e-215, f-Bibliography, see Abstract No. 2874)

2843. ANONYMOUS, "Radio Direction Finding - Technical Evaluation and Type Test of Model DBF-1 Radio Direction Finding Equipment - Final Report on Problem 39R55-04(S1376) - Radio Division II," USN, NRL Letter Report No. S67/69 (1245 MJS) 1240-45/47; 5 June 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

2844. CARBENAY, F., "On a Standardized Aperiodic Pulse Generator and Its Application to the Statistical Recording and Radiogoniometry of Atmospherics," Compt. Rend. Acad. Sci. (Paris), vol. 224, pp. 1624-1626; 9 June 1947. ABSTRACT: Apparatus similar in principle to that used by R. Bureau for atmospheric recording, but including a standardized variable inductive coupling between the capacitor discharge circuit and either the aerial or the input circuit of the receiver-recorder. Some circuit details are given and the methods of use and standardization are described briefly. (a-5, b-1, c-3, d-3, e-0, f-Description)

2845. ANONYMOUS, "DF Station Marconi DFP5 General Description," Directorate of Mechanical Engineering, War Office, (British) Telecommunication No. L842 (Central Radio Bureau Report No. 47/697; 12 June 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Description)

2846. ANONYMOUS, "Bibliography of Antenna Reports," Antenna Research Section, Naval Research Laboratory, NRL Report No. R 3122; July 1947. ABSTRACT: A bibliography listing antenna reports (incomplete) known to exist. Reports are listed chronologically within departmental or laboratory groupings (not necessarily governmental) of origin. Titles are sometimes paraphrased and the possibility of duplication exists within the report. (a-4, b-3, c-1, d-1, e-191, f-Bibliography)

2847. ANONYMOUS, "Radiation from Antennas in the 2.0 - 30.0 Megacycle Band," Signal Corps, Radio Propagation Unit, Technical Report No. 2. See Department of Commerce PB L86032; July 1947. ABSTRACT: This report shows graphically the sky-wave and ground-wave radiation in the 2 to 30 megacycle frequency band from the following antennas: ground-based vertical, ground-based-inverted, horizontal half-wave, horizontal rhombic. The curves of the report are based mainly on theoretical calculations for assumed current distributions on thin wires. The ground system and antenna heat losses are accounted for by efficiency factors obtained from field measurement. The calculations consider the effects of the type of ground over which the antenna is erected in the ground reflection factors and antenna radiation resistances. (a-3, b-3, c-1, d-1, e-0, f-Study report)

2848. GLINSKI, G., "Note on Circular Loop Antennas with Non-Uniform Current Distribution," J. Appl. Phys., vol. 18, pp. 638-644; July 1947. ABSTRACT: Approx. formulae are given for the components of radiation vectors of a short-circuited circular loop with non-uniform current distribution (cd). The formulae are valid for loop perimeter/wavelength ratio of the order of 0.5 or less, and assume the cd of the hyperbolic cosine form. These formulae lead to the radiation intensity formula from which the expressions for the horizontal and vertical field patterns are derived. From the expression for vertical field pattern, it follows that the non-uniform cd produces a pattern intermediate between that for horizontal dipole and horizontal small loop with uniform cd. Using the expression for radiation intensity, formulae for a radius of equivalent circular horizontal field pattern, power gain, average power gain, and radiation resistance are derived. The average power gain is essentially a function of loop radius and decreases with the increase of the latter. The approx. expression for the attenuation constant of the transmission line equivalent to the loop is derived. (a-2, b-1, c-1, d-5, e-0, f-Theory)

2849. HOLT, L. E., "The German Use of Sonic Listening," Jour. Acous. Soc. Amer., vol. 19, part 1, pp. 678-681; July 1947. ABSTRACT: The most successful German sonic listening device, the GHG Gruppen Horch Gerat, is described in general terms. Reference is made to the types of ships using the equipment and to the arrangement and placement of the hydrophone arrays. A brief account is given of the steps taken by the Germans to improve the operation of the GHG by streamlining the array and by altering its position on the hull. The simple but efficient electrical training device is explained, and bearing accuracy and range data, as reported by the Germans, are

presented. The paper is based on technical reports received from Germany and on subsequent investigations. The most important of the sources consulted is the Navy Technical Mission Report prepared by Mr. L. Batchelder. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

2850. LEE, J. M., PAMLER, R. G., AND LAHR, B. M., "Investigation to Determine Characteristics of Horizontal and Vertical Polaization for Very-High-Frequency Two-Course Visual Radio Ranges," U. S. Civil Aeronautics Administration - Tech. Development Report No. 58, July 1947. ABSTRACT: Results of flight tests of range antenna systems indicated that, where buildings and telephone wires are prime reflecting objects, there is little choice between polarization; however, at locations where substantial reflections from trees are obtained, horizontal polarization is far superior to vertical polarization. (a-3, b-3, c-1, d-1, e-0, f-Test report)

2851. LOCKWOOD, C. A., "Electronics in Submarine Warfare," Proc. IRE, vol. 35, no. 7, pp. 712-715; July 1947. ABSTRACT: Account is given of wartime exploits of submarines USS Raton, USS Sailfish, USS Tang, USS Sealion and USS Batfish, with particular reference to their highly successful use of radar and other electronic equipment against enemy vessels. (a-4, b-1, c-1, d-1, e-0, f-Evaluation survey)

2852. PIERCE, J. A., "Radux," Harvard University, Cruft Laboratory. See Department of Commerce PB105121; July 1947. ABSTRACT: This report is a brief disclosure of a proposal for a new very long range hyperbolic radio aid to navigation called Radux. The techniques appear to be direct and the equipment should be easy to develop. Transmitting stations would be complex but automatic in operation and few in number. The navigators' receiver-indicators would be simple and completely automatic, thus leading directly to automatic course tracing and steering. It appears that the reliable range of the new system, even in the presence of tropical static, should approach 3000 miles, if the optimum carrier frequency is used. The average errors to be expected can be predicted and should not exceed five miles at distances up to at least 2000 miles. The errors at short distances, however, will not be less than one or two miles. Radux is accordingly a system giving fairly constant accuracy over large areas. It would, like any other long-range system, require the use of precomputed charts or tables, but would not call for any computations on the part of the navigator. The expected useful range is double that of any existing system and the accuracy at 2000 miles or more should exceed the accuracy of Low Frequency Loran at a third of the distance. Contract N5-ori-76, Task order no. I. HU CL TR17. (a-3, b-3, c-1, d-1, e-0, f-Proposed navigation systems)

2853. SMITH, C. E., "Directional Antennas," Cleveland Inst. of Radio Electronics, Cleveland, Ohio, 1946. See Proc. IRE, vol. 35, p. 706; July 1947. ABSTRACT: The book may be of particular interest to those concerned with the design of vertical tower directional antennas for broadcast stations. It is a thorough, and systematic engineering treatment. (a-4, b-6, c-1, d-1, e-0, f-Book and book review)

2854. ANONYMOUS, "Radio Direction Finding," War Department Technical Manual TM 11-476; July 1947. ABSTRACT: A post World War II technical manual on radio direction finding. Table of contents includes: Introduction; wave propagation theory; propagation as it affects direction finding; radio direction finding antennas; receivers; coupling systems; bearing indicators; radio direction finding systems; characteristics, advantages and limitations of direction finding systems; direction finding error; use of direction finders; orientation of direction finder to map position; methods of calibration; control of sets for position finding; map projections; plotting methods; computation of great-circle bearings and distances; evaluation of results; complex numbers; radio direction finding antennas; directional properties of direction finding antennas; design considerations for receiver input systems; precision and accuracy; trigonometric tables; data chart of ground radio direction finders; glossary. (a-4, b-6, c-1, d-1, e-421, f-Manual, now out of print)

2855. WRIGHT, R. W., JOHNSON, M. H., AND TANNER, H. A., "K-Band Harp," NRL Report R-3112, July 1947. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

2856. ANONYMOUS, "Bibliography of Scientific and Industrial Reports," U. S. Department of Commerce, vol. 6; 4 July 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2857. MUELLER-STROBEL, J. R., AND PATRY, J., "Calculation of Current of the Frame Receiving Aerial," Schweizer Archiv., vol. 13, no. 7, pp. 193-202; 7 July 1947. ABSTRACT: Computation of current of receiver loop antenna, based on study by Hallan, formula for computation of loop antenna is developed; approximate solution for small loops also given; numerical example. (a-3, b-1, c-4, d-4, e-0, f-Theory)

2858. CLECKNER, D. C., "Effect of Feed on Pattern of Wire Antennas," Electronics, pp. 103-105; August 1947. ABSTRACT: Measured radiation patterns for straight wire antennas of various lengths from a half-wavelength to three wavelengths and fed at various points are given. They show that feed point affects the number, orientation and magnitude of the lobes. The equipment used to measure the pattern consists of an electromagnetic transmitting horn and a rotating table upon which a hollow vertical plywood shaft was fastened. The antenna to be measured was mounted on top of the shaft and supported by polystyrene rods when necessary. The antenna was then measured as a receiving antenna. A Littlefuse bolometer is used as the detector. The patterns were continuously recorded by means of a selsyn system between the rotating table and shaft and the recording table. A concentric line lighthouse tube oscillator and a 10 cm two-cavity klystron were used as transmitting sources. (a-3, b-2, c-1, d-1, e-0, f-Descriptive analysis)

2859. GOODE, C. S., "Decca System Navigation," Can Aviation, vol. 20, no. 8, pp. 28-9; August 1947. ABSTRACT: Decca system makes it possible to know where you are in light plane or airliner at any height under all weather conditions and over any sort of terrain; accuracy is within 50 yd over range of 300 mi; airborne Decca receiver weighs only 25 lb; dimensions are 15 by 15 by 7 in., equipment and operation described. (a-3, b-2, c-1, d-7, e-0, f-Decca navigation)

2860. HORNBERG, K. O., "Evaluation of the M-6700 Radar D.F. Antenna," USN, NRL Report No. R-3149; August 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

2861. LEKASHMAN, L., "Electronic Avigation to Date," Aero Digest, vol. 55, no. 2, pp. 54-55 128-129; 2 August 1947. ABSTRACT: Highly specialized military radars developed during war have little direct utility in civil aviation operations; Loran and Gee; Instrument Landing System; Ground Controlled Approach; Bendix Airport Surveillance System, when incorporated with GCA is far superior to best war made s [illegible] radar; it gives full radar coverage of sky within 30 naut mi up [illegible],000 ft and includes 2-way radio equipment operable on all aircraft frequencies; Collision Warning Radars; etc. (a-3, b-2, c-1, d-1, e-0, f-Review)

2862. KHASTGIR, S. R., GUPTA, M. K. DAS, AND GANGULI, D. K. "Some Directional Observations of Atmospherics on 1000 Metres During Sunset Time," Indian Jour. Phys., vol. 21, pp. 169-180; August 1947. ABSTRACT: The theory of sunrise maxima and minima in the number and strength of atmospherics due to ionospheric variations is considered. A method for locating thunderstorm centers producing atmospherics at sunrise or sunset, and results of observations with a cr direction finder are given. (a-5, b-1, c-1, d-8, e-0, f-Experimental theory)

2863. PLATH, C., "Transmission Unit for D/F Quadrantal Error Corrector," Army Air Force, Translation No. F-TS-140-RE; August 1947. ABSTRACT: A manufacturer's manual detailing the operation, installation, and servicing of a mechanical linkage and direct indicating unit that gives the quadrantal error correction for radio direction finders. (a-3, b-2, c-1, d-4, e-0, f-RDF error)

2864. HAMLIN, E. W., AND SMITH, H. W., "Measurement of Phase Front from a Horizontally Moving Source," University of Texas, Austin, Texas, Electrical Engineering Research Laboratory Memo No. 2; 1 August 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Experiment)

2865. KESSLER, W. J., "A Study of Atmospheric Direction-Finding and Ranging," Florida University, Engineering and Industrial Experiment Station, Progress Report No. 2; 17 April-17 July 1947. Technical Information Pilot No. R167. ABSTRACT: A film strip gives indications of the Adcock and loop systems in which there is shown the calibration and ability of the Adcock system to resolve angular changes. Deviations during nocturnal periods are shown in other photographic

plates, especially the variation in the Adcock direction finder. Improvements and measurements made on the wide-band wave-shape amplifier are reported. A graph shows the frequency response of the amplifier, including Hi-pass filter, in which gain in decibels is plotted vs frequency; the frequency response is constant to about 200 kc/sec. Two methods of determining virtual ionosphere heights for the very low-frequency region are given. (a-3, b-3, c-1, d-1, e-0, f-Study)

2866. SEAY, P. A., "An Electromechanical Device for Recording Phase Angle at Radio Frequencies," University of Texas, Electrical Engineering Research Laboratory, Report No. 10; 1 August 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2867. SILBERSTEIN, R., "Radio Propagation Effects on High-Frequency Direction Finders," National Bureau of Standards, Central Radio Propagation Laboratory, Quarterly Progress Report No. 1; 1 January - 31 March 1947; Technical Information Pilot No. R166; 1 August 1947. ABSTRACT: Preliminary plans for the study of the effectsof radio propagation phenomena upon radio direction finding from the basic viewpoint of structure of the wavefront are given. Plans were made for experimental layouts for measuring phases, amplitudes, polarization and relative intensities of arriving radio waves. It was planned to use Harvards' oblique-incidence experiment over a base line from Glenville, N. C. to the Boston area. (a-3, b-3, c-1, d-1, e-0, f-Propagation error)

2868. STRAITON, A. W., GORDON, W. E., AND LA GRONE, A.H., "A Method of Determining Angle-of-Arrival," University of Texas, Austin, Texas. Electrical Engineering Laboratory, Report No. 11; 15 August 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

2869. ANONYMOUS, "GCA in Control Tower," Aero Digest, vol. 55, no. 3, pp. 65, 118-119; September 1947. ABSTRACT: Notes on Navy-Bendix GCA system in operation at Quonset Point, RI, Air base; this vhf fixed station direction finding unit (Bendix FSDF-1) flashes, on 5-in. cathode ray oscilloscope having 360° azimuth scale around its face, bearing of any plane communicating with tower on voice radio. (a-3, b-2, c-1, d-1, e-0, f-GCA description)

2870. KOBILSKY, M. J., "A Note on Coupling Transformers for Loop Antennas," Proc. IRE, vol. 35, pp. 969-973; September 1947. ABSTRACT NO. 1: A theoretical analysis. For optimum signal-to-noise ratio, the loop inductance should equal the primary inductance; general expressions for sensitivity, gain, and selectivity are derived for this optimum condition assuming that circuit noise limits the sensitivity. ABSTRACT NO. 2: The function that determines signal-to-noise ratio is calculated for loop-coupling transformers. It is shown that the optimum signal-to-noise ratio is obtained when the loop inductance equals the primary inductance. General expressions are derived for calculating the sensitivity for a 6-db signal-to-noise ratio, gain, and selectivity in loop-coupling transformers, when the condition of optimum signal-to-noise ratio is also shown in a graph to facilitate the computations. The discussion is limited to the case in which circuit noise is the limiting factor for the sensitivity. (a_1-3, a_2-3, b-1, c-1, d-1, e-0, f-Analysis)

2871. OSTROVSKI, I. E., AND BRAUDE, S. YA, "On the Propagation of Ultra-Short Electromagnetic Waves in the Zone of Direct Visibility," Bull. Aca. Sci. U.R.S.S., Proc. IRE, p. 997; September 1947. ABSTRACT: The propagation of electromagnetic waves of wavelength 1 cm to 9 m over sea and land is discussed theoretically. The intensity of the field due to a vertical dipole is calculated for the case of a small elevation above the surface of the earth of the transmitting and/or receiving dipoles. Certain conclusions are reached with regard to the depth and extension of the field when the dipoles are raised and also with regard to the effect of the operating frequency on the intensity of the field. The variation of the dielectric and conductivity properties of the medium with frequency and the effect of this on the field intensity of the dipole are examined. In studying the propagation of the waves along the surface of the earth, data are obtained on reflection coefficients different from those derived by Fresnel. (a-3, b-1, c-3, d-3, e-0, f-UHF propagation)

2872. SMITH-ROSE, R. L., "Recent Progress in Radio Direction Finding," Atti del Congresso Internazional della Radio (Rome), pp. 877-901; September and October 1947. ABSTRACT: A detailed survey of methods used in the frequency range 10 kc to 1200 Mc. Antenna systems, recent advances in instrumental technique and calibration, accuracy limitations, and the effect of the ionosphere on the accuracy of bearings are discussed. Methods of direction-finding transmission include the rotating-loop beacon, the equi-signal beacon and the Consol system. Future trends in high-frequency direction finders include the use of highly directional receiving systems for the reduction of site errors, more accurate transfer of angular data from the direction finder to the plotting center, and methods to enable the operator to assess the approximate bearing accuracy. (a-2, b-1, c-1, d-9, e-0, f-Survey paper)

2873. HURT, J. M., "Reflection of Plane Waves at and near the Earth's Surface," University of Texas, Austin, Texas, Electrical Engineering Research Laboratory, Memo No. 1; 1 September 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

2874. RADIO DIRECTION-FINDING RESEARCH GROUP, "Abstracts of Published Articles on Radio Direction Finding," Department of Electrical Engineering, University of Illinois, Urbana, Illinois, Technical Report No. 2; 1 September 1947. ABSTRACT: This report contains abstracts of articles referrred to in earlier bibliography report (see Abstract No. 2843 dated 1 June 1947). The abstracts do not represent a complete coverage of the earlier report, but are comprised of a selected group of particular interest to the research team. Free use of Wireless Engineer, Science Abstracts, and Engineering Index has been utilized and acknowledged. (All abstracts contained herein have been utilized for the purpose of this abtract collection.) (a-4, b-3, c-1, d-1, e-723 and 724, f-Abstracts)

2875. ANONYMOUS, "Radio Direction Finding Research and Development Projects," Signal Corps, Engineering Laboratory: Coles; 15 September 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Project survey)

2876. ANONYMOUS, "SCR-575 D/F: Errors from Proximity of 70 Foot Communications Masts," Engineering Division, Watson Laboratories, Air Materiel Command, Red Bank, New Jersey, Memo Report No. WLEPE-2A-12; 26 September 1947. ABSTRACT: The purpose of the report is to determine the effect that two 70-foot masts, mounted with three dipole antenna equipments, Type RC-81, would produce on the performance of Radio Set SCR-575 when located at a distance of 100 feet therefrom. (a-1, b-3, c-1, d-1, e-139, f-Test report).

2877. ANONYMOUS, "A New British Radio Compass," Electronic Eng., vol 19, p. 325; October 1947. ABSTRACT NO. 1: A flattened loop aerial is housed either in a shallow blister or within the aircraft body. In automatic operation the loop, when tuned to signals from a radio beacon, sets itself in the position of minimum signal and indicators operated by a "Desynn" servo system give the correct bearing. The loop can also be continuously rotated at a variable speed and the minimum-signal position determined aurally. Accuracy is within 1°. ABSTRACT NO. 2: The radio compass which has been developed to meet the specifications of the R.A.F. embodies the "Desynn" servo system. The antenna of the radio is of the loop type, sunk into the aircraft body, with a cover moulded to the fuselage, so that there is no projection whatsoever. In the operation of this equipment it is necessary to rotate the loop to the position where the minimum signal is received from the beacon. With the new radio compass it is only necessary to tune in the beacon and rest follows automatically. Operation is simple and takes only a matter of seconds. (a_1-2, a_2-3, b-2, c-1, d-1, e-0, f-Description)

2878. BUCHER, F., ET AL., "Study of Electronic Direction Finding Techniques," Federal Telecommunications Laboratories, Newark, New Jersey, Technical Information Pilot No. U311; October 1947. ABSTRACT: Graphs are given of the voltage standing-wave ratio produced by a "Dilectene" -filled horn measured on a 50 ohm coaxial line, noise vs ionization current in X-185-F gas-discharge tube, and phase shift obtained with a phase modulation scanning system. Automatic electronic indicator schematic drawings and indicator patterns are included as well as drawings of 600 mc "Dilectene" - filled horn and the 4-horn electronic direction finder using neon-loaded wave guides (9,500 mc) Patent information is included. (a-3, b-3, c-1, d-1, e-0, f-Study report)

2879. HARRISON, D.N., "Direction-Finding and the Measurement of Wind by Radio," Met. Mag., vol. 76, pp. 217-225; October 1947. ABSTRACT: A general review of methods used by the British Meteorological Office for heights up to about 20 km. The radiosonde transmitter and Adcock direction-finding sets are being replaced by reflectors and radar sets, which give a greater accuracy but, at present, a reduced range of observations when wind velocities are high. Future

development will be directed toward attaining heights up to at least 30 km, higher instrumental accuracy and better automatic operation. (a-6, b-1, c-1, d-5, e-0, f-Summary)

2880. LOUCKS, R.B., "An Azimuth Trainer for Evaluating the Interpretability of Directional Indicating Flight Instruments," Army Air Force, Air Materiel Command, Engine Division Memo No. TSEAA-694-16. See also Department of Commerce PB L86274; October 1947. ABSTRACT: The critical features of an azimuth ground trainer, which will insure stable and dependable operation are described. Photographs are included. (a-3, b-3, c-1, d-1, e-0, f-Instrument trainer)

2881. PAGE, H., "Anti-Fading Series-Loaded Mast Radiators" BBC Quart. vol. 2, pp. 165-176; October 1947. ABSTRACT: The radiation characteristics are derived for a mast consisting of two collinear sections separated by an insulator across which a variable reactance is connected. The results are applied to practical cases and the design data are summarized graphically. By varying the reactance, the mast can be used for a range of wavelengths, and the vertical polar diagram can be varied to suit a particular service area. (a-6, b-1, c-1, d-5, e-0, f-Analysis)

2882. GEORGE, S.F., "Direction Finder Bandwidth Requirements," USN, NRL Report No. R-3182; 1 October 1947. ABSTRACT: An incoming signal, whose accurate bearing is being sought by a goniometer type direction finder, is traced by mathematical analysis from the collector, through the goniometer, through the receiver sections, and finally to the cathode ray indicator which provides a visual bearing indication. At each point in the analysis, the effects of the various components of the system on the signal are considered, with special emphasis on those effects which tend to cause inaccurate or obscured bearing presentation. The greatest emphasis is placed on the bandwidth requirements, in the various sections of the direction finding receiver, that are essential to the maintenance of accurate and sharply defined bearings. The analyzed receiver input consists of two sidebands symmetrically displaced about the carrier frequency of the incoming signal by the goniometer modulation or rotation frequency. It is found that, in the sections of the receiver prior to the second detector a change in the relative phase shift of the side-bands causes bearing error whereas a change in the relative amplitudes of the side-bands causes obscured indication. The radio frequency and intermediate frequency bandwidths needed to prevent inaccurate and obscured bearing indications are shown to be directly proportional to the ratio between the goniometer modulation frequency and signal carrier frequency. Carefully designed frequency conversion and linear detection systems do not contribute to bearing inaccuracy or obscurity. The total bandwidth required of the circuits following the second detector is found to be proportional to the goniometer modulation frequency alone. Mention is made of methods which can be used to reduce the rather severe bandwidth requirements explained in this work. (a-1, b-3, c-1, d-1, e-275, f-Theory)

2883. ANONYMOUS, "Bibliography of Scientific and Industrial Reports," U.S. Department of Commerce, vol. 7; 3 October 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

2884. WIKLAND, T., "Basic Principles of Radio Echoes and Structural Elements," Teknisk Tidskrift, pp. 733-735; 4 October 1947. ABSTRACT: The distance to the targets is measured by the lapse of time between transmission of a radio wave and reception of the reflected wave. Time can be measured by either the interference or the impulse method. Direction is measured by sound intensity of the echo signal's amplitude, or by exact measurement by changing the loop. Calculation of the range of free propagation in space is shown and an explanation is given of the limitations and conditions under which the radio echoes are most effective. The influence of ground deflection is discussed along with the effect of atmospheric refraction and absorption upon range, and the selction of wavelength for various radio echo stations. (a-3, b-2, c-17, d-17, e-0, f-Study)

2885. TAI, C.T., "Radiation of a Hertzian Dipole Immersed in a Dissipative Medium," Cruft Laboratory, Harvard University, Cambridge, Massachusetts, Technical Report No. 21; 10 October 1947. ABSTRACT: The general radiation formula for a Hertzian dipole immersed in an arbitrary dissipative medium of the infinite extent has been derived. As a boundary condition of the source it is assumed that the dipole moment is given a quantity. When the conductivity of the medium is finite the total radiation power is found to be infinite. Thus, in order to define a finite physically meaningful quantity, the dipole must be insulated. The total radiating power is then a function of the thickness of the insulator and the constants of the media. When the radius of the sperical insulator is large compared to a wave length the reflection coefficient of the waves traveling from the dielectric to the dissipative medium with the dipole as a source reduces to that of a plane wave as derived from Fresnel's equations. The similarity between the problem of an insulated dipole and the diffraction problem studied by Weyl, is discussed in this paper. (a-1, b-3, c-1, d-1, e-0, f-Theory)

2886. STRONG, C.E., "Position-Finding by Radio: First Thoughts on the Classification of Systems," Electrician, vol. 139, p. 1221; 24 October 1947. See also Engineer (London), vol. 184, pp. 446-447; 7 November 1947. ABSTRACT NO. 1: Long abstract of Chairman's address, Radio Section, IEE. The need for revising current terminology for classifying radio position-finding systems is stressed. A time-sharing multiplex system combining radar and communication services to aircraft on a common frequency is described. ABSTRACT NO. 2: System of classification outlined differentiates between radio communication and radiolocation, latter term being expanded to include all methods of position determination, including direction finding and radar; radiolocation is then divided into two categories covering "range determination" and "direction determination," while these, in turn, are subdivided into broad based and narrow based systems. From address before Instn. Elec. Engrs. (a_1-6, a_2-3, b-2, c-1, d-5, e-0, f-System classification)

2887. ANONYMOUS, "Handbook of Operation and Service Instruction: Position Indicators and Transmitters," U.S. Air Force and Bureau of Aeronautics, AN-05-55A-1. See Department of Commerce PB44339r; November 1947. ABSTRACT: This handbook contains 123 pages including photographs, drawings, and tables. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

2888. ANONYMOUS, "New Radio Compasses," Wireless World, vol. 53, pp. 417-419; November 1947. ABSTRACT NO. 1: Details of aircraft radio equipment exhibited recently at Radlett aerodrome. Comprehensive descriptions with photographs of two new radio compasses manufactured respectively by G. E. C. and Marconi's Wireless Telegraph Company. An intercommunication system, general purpose transmitters and receivers, and a compact vhf R/T are also mentioned. ABSTRACT NO. 2: The radio compass can be described as an automatic direction finder, because once tuned in to a station it indicates every change in bearing of that station in relation to the heading of the aircraft. Operation of the G.E.C. installation and the Marconi automatic direction finder, Type AD 7092, are described. Both function on the principle of modulating the signal received on a loop by a low-frequency oscillation and mixing with it the same signal received on a short vertical antenna. After amplification and rectification, the phase of this composite signal is compared with that of the original low-frequency oscillation, and the error is utilized to control a servo system for rotating the loop. Although basically the same, there are many differences in the way the results are obtained in these two radio compasses. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

2889. APPEL, R., SCHLICKE, H., AND RINDFLEISCH, H., "Problems in Theory and Technique of Antennas," AMC Intelligence, Translation No. F-TS-2222-RE; November 1947. ABSTRACT: Data are presented on numerous types of antennas and their uses. Characteristics of operation and development of fixed antennas, directional-antenna systems with amplifiers, aircraft antennas, and short wave and directional antennas are discussed. Each antenna is described and recommendations are made for further development. Raw materials used in manufacture and possible substitutes are listed. Calculations are presented for the design and matching of antennas. (a-3, b-3, c-1, d-4, e-0, f-Antenna study)

2890. COX, C.R., "Mutual Impedance between Vertical Antennas of Unequal Heights," Proc. IRE, vol. 35, pp. 1367-1370; November 1947. ABSTRACT: An expression is derived for the resistive and reactive components of the mutual impedance between vertical antennas of unequal heights, located above a perfectly conducting ground. Mutual-impedance curves for typical combinations of antenna heights are plotted for spacings between 0.1 and 1.0 wavelength. To the designer of power-distribution apparatus for directional antenna arrays, the evaluation of mutual impedance between elements of the array is the first step in a series of calculations leading eventually to the determination of all system parameters. Sufficient data exist in the literature to accommodate the usual problem in which all radiating elements are equal in height, but for the occasional instance involving radiators of unequal heights no mutual-impedance data are available. It is the purpose of this paper to derive an expression from which may be calculated the mutual impedance between radiators of unequal heights, mounted vertcially above a perfectly conducting earth, and thus to fill

in a gap which in some case hinders the proper design of antenna-phasing networks. (a-1, b-1, c-1, d-1, e-0, f-Theory)

2891. GARNER, W.R., AND HAMBURGER, F., "Detectability and Discriminability of Targets on a Remote Projection Plan-Position Indicator," Proc. IRE, vol. 35, pp. 1220-1225; November 1947. ABSTRACT: Quantitative results were obtained on minimum detectable signals and minimum separation between two targets as a function of the following variable factors: video gain, crt bias, signal clipping, light-source intensity, type of diffraction screen, and position of the operator. The projection (p.p.i.), using a dark-trace tube, appeared to be 1 db worse than a standard 5-inch p.p.i., when each instrument was operated under its optimum conditions. (a-6, b-1, c-1, d-1, e-0, f-Experiment)

2892. SILBERSTEIN, R., "Radio Propagation Effects on High Frequency Direction Finders: Phase I, Experimental; Phase II, Literature Survey," U.S. Bureau of Standards, Central Radio Propagation Laboratories, 3rd Report; 1 November 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study. See Abstract no. 2867 dated 1 August 1947)

2893. HAMLIN, E.W., SEAY, P.A., AND GORDON, W.E., "A New Solution to the Problem of Vertical Angle-of-Arrival," University of Texas, Austin, Texas, Electrical Engineering Laboratory, Report No. 13; 13 November 1947. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

2894. JOLLIFFE, S.A.W., AND WATSON, D., "Recent Advances in Aerial Balancing Technique and Radiogoniometer Design in Relation to High Frequency Direction Finders," Marconi Rev., vol. 10, pp. 142-156; October to December 1947. ABSTRACT NO. 1: The causes of instrumental error in the antenna and radiogoniometer system of an Adcock D/F system are considered. A method of balancing such a system without introducing spurious effects due to bad siting of a local transmitter is described, and this method is compared with other techniques. A FM field transmitter for speedy and accurate calibration of wide-band hf direction finders is described. "Errors in the radiogoniometer due to the 'vector sum' component of the voltage induced in the antennas are considered. Methods of reducing coupling law errors are given, and a balanced potentiometer which produces accurate voltage ratios for error curve tests is described." ABSTRACT NO. 2: Instrumental errors in the use of an Adcock D/F equipment are considered and a method of balancing the system without introducing spurious effects is described. The balancing unit comprises an arrangement of 4 metal rods disposed in a square around a fifth rod and connected to the 4 elements of the aerial, and a coupling loop. By applying a signal to the central rod and connecting a receiver to the loop, the balance of the aerial system may be measured. The technique compares favourably with other methods such as field transmitter, radiating sense aerial, std. N.P.L. methods, etc. To calibrate wide-band D/F equipment a FM transmitter, sweeping through a preset band of frequencies, is employed. A portable unit is described. Radiogoniometer errors are mainly due to the vector sum component of the induced voltage, and a form of balanced potentiometer circuit may be used for producing accurate voltage ratios for testing. (a_1-5, a_2-2, b-1, c-1, d-5, e-0, f-Experimental investigation)

2895. LINDENBLAD, N.E., "Slot Antennas," Proc. IRE, pp. 1472-1479; December 1947. ABSTRACT: The development of flush-type radiators of the slot and pocket type, especially types applicable to aircraft. Specific solutions to altimeter and market-beacon pickup antennas are described. The general aspects of the phenomena which are involved are examined, and it becomes evident that workable solutions, in the majority of cases, can be obtained only by means of actual experiment, since variations in the surroundings have first-order influence upon such vital characteristics as radiation patterns, slot impedance, and bandwidth. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

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2896. SMITH, R. A., "Radio Aids to Navigation," Cambridge University Press, London, 114 pp. 9s. See also Wireless Eng., vol. 24, p. 373; December 1947. ABSTRACT: The material was originally prepared for the Ministry of Supply (Air) Scientific War Records. "The various systems are briefly described in general terms, sometimes with the aid of block diagrams, and their main characteristics are given." For another review see Wireless World, vol. 54, p. 30, January 1948. (a-6, b-6, c-1, d-5, e-0, f-Book. See Abstract No. 2726, 1947)

2897. WHEELER, H. A., "Fundamental Limitations of Small Antennas," Proc. IRE and Waves and Electrons, vol. 35, pp. 1479-1484, December 1947. See also Proc. IRE (Australia), vol. 10, pp. 47-52; February 1949. ABSTRACT: A capacitor or inductor operating as a small aerial is theoretically capable of intercepting a certain amount of power, independent of its size, assuming tuning without circuit loss. The practical efficiency relative to this ideal is limited by the "radiation power factor" of the aerial as compared with the power factor and band-width of the aerial tuning. The radiation pf of either kind of aerial is somewhat $> Ab/6\pi l^3$ where Ab = the cylindrical volume occupied by the aerial, l = the radianlength ($1/2\pi$ wavelength) at the operating frequency. The efficiency is further limited by the closeness of coupling of the aerial with its tuner. Other simple formulae are given for the more fundamental properties of small aerials and their behaviour in a simple circuit. Examples for 1 Mc/s operation in typical circuits indicate a loss of about 35 db for the I.R.E. standard capacitive aerial, 43 db for a large loop occupying a volume of 1 m square by 0.5 m axial length, and 64 db for a loop of 1/5 these dimensions. (a-3, b-1, c-1, d-1, e-0, f-Radiation)

2898. FRADIN, A. Z. AND KHATSKELEVICH, V. A., "Investigations of Resonances and Asymmetries in Adcock Aerial-Feeder Systems," Radiotekhnika, vol. 3, pp. 6-28; 1948. ABSTRACT: All possible asymmetries of an Adcock system comprising vertical dipoles, their horizontal feeders and the vertical down leads, are considered, and the relevant characteristic impedances and other parameters derived from the analysis of phase displacement, decrements and radiation resistances of single elements. Criteria for complete symmetry are proposed, and the conditions of symmetrical and asymmetrical, co-ordinated and non-co-ordinated systems are introduced and described by the state of corresponding electrical lengths, radiation resistances and propagation constants of dipole and feeder elements. The resulting resonances, frequency characteristics and directional properties are tabulated. (a-2, b-1, c-2, d-2, e-0, f-Study)

2899. FRANZ, K., "Aerials; FIAT Review of German Science," 1939-1946," Electronics, incl. Fundamental Emission Phenomena, Part 2, pp. 65-89; 1948. ABSTRACT: Discussion of the properties of dipole, long-wire, and parabolic antennas, slot and dielectric radiators, and of various measurement methods, with references to 26 relevant papers. (a-6, b-2, c-1, d-1, e-0, f-Survey)

2900. HANDEL, P. V., "Direction Finding; FIAT, Review of German Science, 1939-1946," Electronics, incl. Fundamental Emission Phenomena, Part 2, pp. 173-183; 1948. ABSTRACT NO. 1: The term "direction finding" is used in the wider sense to include bearing and distance measurements with hf waves. Small base arrangements, in which the base length is small compared with λ, are first considered, then large-base systems, and finally methods of distance measurement. References are given to 35 relevant German publications. ABSTRACT NO. 2: Covers German wartime developments. The "great base" method relies on vhf operation from 2 transmitters wide apart (13 km, d≫λ) creating an interference field of confocal hyperbolae (1,859 lines). A similar method was also developed for long wave operation on 1,000 m. The "small base" method employs loop and/or aerial combinations of dimensions ≪λ. Distance measurements (similar to "Loran") rely on phase comparison on long waves. Meterorological investigations, particularly of propagation immediately above sea level, are also reported. (a_1-6, a_2-5, b-1, c-1, d-1, e-0, f-Summary)

2901. KESSLER, W. J., "A Study of Atmospheric Direction-Finding and Ranging," Florida University, Engineering and Industrial Experiment Station, Quarterly Progress Report No. 4; TIP No. U603; 1948. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 2966)

2902. LUTKIN, F.E., CARY, R. H. J., AND HARDING, G. N., "Wide-Band Aerials and Transmission Lines for 20 to 85 Mc/s," JIEE (London), part IIIA, vol. 93, no. 3, pp. 552-558; 1948. ABSTRACT: Systems covering the frequency bands 20 to 30, 40 to 50 and 50 to 85 megacycles are described which can deal with pulse transmissions of 600 kilowatts peak power. The aerial arrays are built up of full-wave center-fed dipoles of wire-cage construction, with an input impedance of 600 ohms. Open wire transmission lines are used throughout. Wiremesh reflectors are used to obtain the horizontal polar diagram required; their effect on dipole impedance is discussed. An exponential transformer is described which simplifies the construction of arrays consisting of four fullwave dipoles, its function being to transform an impedance of 300 to 600 ohms. Compensating stubs may be used to increase the bandwidth of the wide-band aerials. (a-6, b-1, c-1, d-5, e-0, f-Description)

2903. PRATT, H., SUITS, C. G., HARRISON, G. R., STEPHENSON, H. K., JONES, E. L., WILLIAMS, C., JORDAN, L., AND BURROWS, C. R., "Applied Physics -- Electronics - A History of Divisions 13 and 15 and the Committee on Propagation, NDRC," Science in World War II Series, Office of Scientific Research and Development, Little, Brown and Company, Boston, 1948. ABSTRACT: A volume of histories prepared under the direction of the respective administrative units of the National Defense Research Committee. The table of contents under Book One: Electronics, includes 32 short chapters with appendices many of which deal with various aspects of radio direction finding. Some titles included are beginning of radio countermeasures, countermeasures against radio direction finders, antennas, direction finder research, electrical DF evaluator, effects of terrain on radio propagation, ionosphere and radio propagation studies, direction finding on atmospherics, and propagation experiments. A very concise review of National Defense Research Committee activities in World War II related to radio direction finding, countermeasures and related subjects including antennas and propagation is given. The various sections include comments on jamming and review problems which were encountered. For instance "Studies were made at the Bell Telephone Laboratories of the principles of radio navigation, including surveys of methods in use or which might come into use. This work provided a background both for general studies and for more detailed consideration of countermeasures and anticountermeasures for specific navigation schemes. A Japanese system of high-frequency direction finding used for aerial navigation made use of direction finders at land-based stations on which signals from the plane were received; information as to the plane's position was then transmitted to the aircraft. This was studied, and three methods of controlling the system considered: namely, jamming the DF station itself, jamming the communication channel through which the plane was given its information, and meaconing. The latter is a system for creating errors in the bearings taken by the DF stations. Use of both airborne and land-based jammers and the meacons was considered. A jamming transmitter must deliver at the enemy receiver a stronger field than that of the enemy transmitter and be associated with an antenna which is an efficient radiator and has the proper polarization. Where a directive antenna toward the receiver to be jammed can be used, it is equivalent to a considerable increase in jammer power. It is desirable that these characteristics exist over a relatively wide band of frequencies, thus avoiding the necessity of antenna tuning when frequencies are changed, in the case of spot jammers. It is essential, of course, with the barrage jammers which sweep over a wide frequency band. With airborne jamming, the antenna problem is aggravated because of the difficulty of mounting antennas on an aircraft fuselage for use in the upper high-frequency and very-high-frequency bands without introducing a serious distortion of the pattern by the resonant and shielding effects of the near-by wings, tail, propeller, other antennas, etc. As a result of such distortion, a given antenna which operates well on one aircraft may prove quite unsatisfactory on another of a different shape or with a different assortment of antennas. To reduce such effects, the stingaree antenna was designed by the Bell Telephone Laboratories. It was a relatively broad-band doublet antenna designed to be trailed behind the aircraft using a coaxial fitted cable as a towline, thus removing the antenna from the immediate vicinity of the aircraft. For vertical polarization a 30-pound weight was employed at the end of the antenna, causing it to fly at approximately 45° from the vertical. When horizontal polarization was desired, a small windsock was used which caused the antenna to fly within 10° of the horizontal. This performance was for air speeds of the order of 200 miles per hour. This type of antenna was investigated in the 20 to 50 mc range. Measurements of radiation pattern were made during flight tests at Cold Spring Harbor, Long Island, and also at Florosa Field. The radiation pattern for vertical polarization is reasonably circular in a horizontal plane except for a minimum to the rear of the plane due to the tendency for a cone of silence to develop because of the tilt of the dipole in flight." Throughout the activities of Division 15 it was recognized that, in order to place proper emphasis on the various phases of countermeasures work, it was important to maintain a close liaison with theater communications and Intelligence personnel. For this purpose, experienced RCM people from the Bell Telephone Laboratories were sent to the various theaters for limited periods. Three men were sent to the Southwest Pacific area for about four months each. They were concerned mainly with the communications countermeasures organization in the theater, the enemy countermeasures actively employed, anti-jamming measures, search problems for obtaining information on the enemy use of radio, wave-propagation problems, and the planning of Allied radio countermeasures. Another man was sent to the Mediterranean theater to investigate the value of communications countermeasures there. Two men were also in the ETO for extended periods, working with ABL-15 and the 8th and 9th Air Forces. Two men were sent to the Pacific theater. In addition to these activities, a man was assigned to participate in Army maneuvers in this country where the effectiveness of countermeasures was being investigated. This firsthand experience with theater problems and requirements, in addition to information obtained from intelligence reports, proved valuable in deciding the trend of investigations undertaken. Additional comments are given on "Another project concerned with communications countermeasures [which] was assigned to the Radio Corporation of America starting January 15, 1943, and was carried out by the Communications Division of the RCA Laboratories under the direction of H. H. Beverage. This work was divided among four headings: (a) jamming-transmitter techniques; (b) deception and confusion techniques; (c) anti-jamming techniques; and (d) antenna and transmission-line developments. Probably the most effective anti-jamming device known for communication is continuous wave telegraphy. A good operator can copy intelligence reports through certain types of noise or jamming about ten times stronger than the desired signal. In order to do an efficient job of job of jamming CW telegraphy, it is necessary to concentrate the jamming energy within a few cycles of the CW victim signal. Several devices were developed to accomplish this purpose, but it was found difficult to operate them on signals which were interrupted to make the dots and dashes of the Morse code. Additional work on jamming and anti-jamming of telegraphy was performed in the Federal Telecommunications Laboratory operated by the Federal Telephone and Radio Corporation. A very extensive study was conducted with a large number of different types of jamming signals at audiofrequencies, radio frequencies, with or without limiters, with the Laboratory equipments, and also with actual Army and Navy communication sets. The tests covered barrage jamming and the spot frequency jamming, and the type of jamming signals used covered resistance, noise, multiple tones, a variable pitch so that the random pulses had characteristics similar to telegraphy, etc. The research also covered the tests concerning the human factors, involving the experience of the operator, fatigue of the operator, nervous reactions to different types of noise, etc. All the tests indicated that results can be produced accurately when confined to laboratory tests. Jamming efficiency can be defined when the human factor is eliminated. An experienced operator presents a protection against jamming which can be estimated at roughly 12 db (decibels) plus an additional factor of 6 to 8 db due to the difference in susceptibility to fatigue. Even an experienced operator after 20 to 30 minutes of jamming will lose his ability to distinguish signals through noise." Detailed comments on wideband antenna problems are also provided, for instance "Since radar countermeasures transmitters must be capable of operating at whatever frequencies may be selected by the enemy, the antennas to go with these transmitters should preferably operate over as wide a range of frequencies as possible. In this way, the operating frequency may be changed without retuning the antenna or switching over to a new one. In the early days of the Radio Research Laboratory, this problem was clearly recognized, and a program of designing and developing countermeasures antennas of as large a band width as possible was begun. However, for the sake of speed, the Services went ahead with the procurement of certain interim RCM antennas which, because of their narrow band width, had to be cut to the frequency at which the associated transmitter was to be used. Prior to the war, there had been little reason to develop antennas for wideband operation. The requirements of television, radar and multichannel VHF were all satisfied by radiators capable of operating over a 10 percent frequency range. Yet some of the designs worked out for these three applications proved to be useful in the case of RCM. Low-frequency countermeasures transmitters were used with the thick sword-type stubs originally designed for use with VHF in the 100 mc frequency range. From television came the cone antenna design widely used for RCM receivers." Beverage antennas were also commented on (page 93): "Work carried out by the RCA Laboratories on antennas and transmission lines was concerned with the wave antenna for transmission at ground stations and broad-band antenna for aircraft. That the Beverage wave antenna principle, originally thought to be limited to use in reception, could be applied to transmission purposes was suggested by N. E. Lindenblad of the RCA Laboratories and was tried out at the Goose Bay, Labrador, Station of the Army Airways Communication System using frequencies between 100 and 200 mc.* These tests were successful and showed an actual signal gain of 10 db at 800 miles' distance in comparison with the conventional flat-top antennas supported by 180-foot towers. This advance in transmission antennas filled a very urgent need. It provided the very welcome elimination of the particular type of flying hazard due to radio towers and was relatively inconspicuous, its construction being similar to a telephone line. It also reduced very greatly the amount of material which had to be flown to the Northern outposts. In order to obtain sufficient signal strength with the 180-foot-tower antennas, it was necessary to provide our engineers with ground systems in order to obtain low ground loss, and a total antenna resistance of 2.5 ohms was thus achieved. This low resistance, however, went contrary to stringent requirements introduced by frequency shift given in conjunction with teletype transmission. The wave antenna, however, eliminated this difficulty entirely. The success of the low-frequency wave antenna in the North Atlantic suggested the possibility of using wave antennas on the high frequencies. Experiments were undertaken by RCA Laboratories using a frequency of 1640 mc.,** which indicated that a wave antenna two wave lengths long was superior in the direction of maximum

radiation to a 100 percent efficient vertical antenna. At Camp Cole experiments were subsequently carried out with the wave antenna covering a wide range of frequencies up to 20 mc. The problem of developing broadband antennas for aircraft was an extremely difficult one. The characteristics of the antenna depend upon the type and size of the airplane, the location of the antenna on the airplane, the presence of other antennas and obstacles such as gun turrets, and several other features which all combine to make the problem different for every airplane and for every location on the airplane. At the frequencies and air speeds involved, it is impractical to use antenna structures large enough to be intrinsically broad-band, so the problem had to be approached from a different direction. One of these developments, called the sleeve antenna, was based on an invention of N. E. Lindenblad, first used in the NBC television antenna erected on the Empire State Building before the war. Essentially the radiating portion of this antenna consists of a straight conductor surrounded by a sleeve which extends beyond the ground plane of a skin of the airplane on which it is mounted. By properly selecting the dimensions of the antenna arrangements and the arrangements for matching the antenna to its transmission line, the sleeve antenna may be used over a frequency range of about one octave without adjustment. Several series of these sleeve antennas were developed. As early as 1936 the development of cone antennas was started at the Rocky Point Laboratories of RCA Communications, Inc. From that time on extensive development was carried on by RRL and a large number of antennas of this type were developed for use on airplanes. Frequency bands of several octaves were covered by some of these arrangements. A second type of airborne antenna, called the slot antenna, was devised. It consists essentially of one or more slots in the skin of an airplane backed by cavities. The method was radical and its practical application slow. As the Rocky Point group advanced in this development, other antenna development groups became interested in its possibilities and eventually the work was undertaken by several laboratories. While methods for obtaining extraordinary band width with this type of antenna were investigated and demonstrated by the Rocky Point group, the most immediate problem was to develop a type having the smallest possible dimensions and sufficient band width for radio heightfinding purposes. The slot antenna became recognized somewhat too late for extensive use during the war, but it is felt that it provides the ideal aerodynamic characteristics required in high-speed aircraft and should find considerable application in the future." Antenna reradiation measurements are mentioned on page 95 where various pattern measuring techniques are discussed. For instance "A third method was to measure the reradiation of the receiving antenna. A remotely located remitting antenna excited by an unmodulated transmitter sent a wave toward the model. This wave induced currents in the model antenna which was a function of the impedance connected to its terminals. If the termination impedance is made to vary periodically, the field reradiated from the model antenna will also vary periodically. The resultant modulation permits the reradiation field to be distinguished from the primary or exciting field." The book also provides names and information on the organization of Division 13 of NDRC. The group that became Division 13 was one of the first organized in the National Defense Research Committee. Originally known as Section C-1, an abbreviation of "Section 1, Communications," its first meeting was held in Washington, D. C., September 11, 1940, to initiate a research program in radio communications as an implement to the defensive position of the United States faced with the growing threat of the war, which was at that time confined to Central Europe. Dr. C. B. Jolliffe, Chief Engineer of Radio Corporation of America, was asked to be the Chief of Section C-1. In that post he reported to Dr. Frank B. Jewett, NDRC member. When Section C-1 was reorganized as Division 13, with its first meeting December 16, 1942, Dr. Jolliffe was appointed Division Chief and reported to Dr. James Bryant Conant, who in turn reported to Dr. Vannevar Bush, Director of the Office of Scientific Research and Development. After the reorganization of Section C-1 as Division 13, Dr. Jewett continued as the head of the reviewing group. Membership of Section C-1 was initially composed of the following men, each one a leading authority in the field of radio communications: O. E. Buckley of Bell Telephone Laboratories, J. H. Dellinger of the National Bureau of Standards, W. L. Everitt of Ohio State University, J. A. Hutcheson of Westinghouse Electric and Mfg. Corporation, L. F. Jones of RCA Manufacturing Company, C. F. Metcalf of General Electric Company and Haraden Pratt of Mackay Radio and Telegraph Company. Extensive direction finding history and technical summary information is provided beginning on page 125. For instance "One field in which this country was less experienced than Britain concerned radio direction finding. As this was of vital military importance, requests for improvements were continually given to Division 13 by the Army and the Navy. As an example, the U. S. Navy received reports from their London liaison office which indicated that desirable DF equipments were being developed in British laboratories, and requested Division 13 to interpret these reports. To observe the work of British DF laboratories and to bring the results to the division, E. D. Blodgett of the Radio Corporation of America was appointed Division Consultant. He visited Great Britain from April 26 to June 4, 1942. After his report, Division 13 was able to assign DF projects to American contractors without fear of duplicating British work, and with a better understanding of the trend of Allied direction finding in general. Although at the beginning of the war DF art was better developed in Britain than in the United States, concentration by Division 13 on the more automatic forms of direction finders, along with investigations of fundamentals, resulted in a rapidly advancing level of direction-finding technique in this country. The activities of the DF Section of Division 13 were in such demand by the middle of 1942 that the Section Chief, L. F. Jones, required the services of a Technical Aide. This position was temporarily given to W. C. Lent. In May 1943, it was transferred to John L. Allison of Federal Telephone and Radio Laboratories, who had been active in DF research since the beginning of the war. Shortly before this Dr. Murray required an Assistant Aide, and J. F. McClean was given the job. By the end of 1943 several specific problems had appeared. The U. S. Navy had experienced difficulties in attaining expected accuracies with direction finders, the designs of which followed Division 13, while the British liaison officers suggested that British DF had solved certain installation problems which were believed responsible for the difficulties. The state of DF instrumentation had advanced so rapidly through Division 13's efforts that it appeared desirable to acquaint the more conservative British laboratories with the advances of American designs. Mr. Allison spent May and June of 1944 visiting the DF establishments in Great Britain, and brought back information on techniques of installation and of testing shipboard DF installations. Other information included recent British findings in VHF direction finding, in improvements of high-frequency DF sites, and in precision equipment for VHF and UHF goniometer measurements. A new departure in DF improvement was the attack on evaluation of DF network bearings. British Admiralty Signals Establishment was making a thorough statistical study of the problem associated with this attempt to improve DF accuracy and reliability. The information Mr. Allison brought back to the United States was the basis of the successful solution which Division 13 made during the last months of the war. Optimism evoked by the success of the Normandy invasion affected the organization of Division 13. All its sections, except those handling DF and precipitation-static problems, planned to terminate their activities. Dr. Jolliffe, who had given so much of his time to the division, felt that this was the opportunity to return to his industrial activities, and he relinquished the chairmanship of the division to Haraden Pratt. Dr. Murray resigned as Technical Aide to take a similar position with Division 5. Shortly after these changes, the military situations in Europe deteriorated; the Services demanded improvements and alterations in communications equipment; the British representatives in this country requested a more active program in communication research; and there were other evidences that there was still work to do. Mr. Pratt, as Division Chief, undertook to revitalize the organization to meet the new demands." Direction finder research is described beginning on page 135 where it states "NDRC approved, on April 18, 1941, a contract with the Western Electric Company for research on fixed Adcock antenna direction finders to determine antenna spacings for minimum interaction effects, to determine requirements for buried conductor arrangements, and to design antenna elements and coupling units. The growing menace of German submarines to Allied supply lines made such research of considerable importance. The efforts of Karl Jansky and Dr. H. T. Friis were directed to this problem. By October 31, 1941, progress was so promising that the contract was extended. The final report was submitted by Western Electric Company July 17, 1942. The results of the study included the design of a very efficient antenna and coupling system, in which thick (one-foot-square) antenna elements made of wood and covered with copper foil were fed into balance-to-unbalance aperiodic transformers from which coaxial transmission lines led to the radio receiver system. By this means the antenna impedance was kept so low (from 5 to 15 mc) that impedance matching to the transmission line was good. The most revolutionary design of the program was that of the receiver system. Using the twin-channel arrangement popular with the British Royal Navy, Mr. Jansky overcame the necessity for maintaining exact phase and amplitude alignment which had always been so difficult in European twin-channel direction finders. A signal differing a few hundred cycles from the intercepted frequency was transmitted from an auxiliary transmitter via an antenna on a line 45° from the axis of both Adcock antenna pairs. Both receivers were given a stiff automatic-gain control adjustment, and the injected signal thus maintained equal gain in the two receivers, eliminating the necessity of frequent realignment of gain. The phase alignment problem was solved, because the cathode-ray indicator responded to the heterodyne between the intercepted and the locally injected signals, which were so close together in frequency that identical phase was provided in the two receivers. The equipment was produced for the Signal Corps as SCR-501 Direction Finder. Due to the unwieldy antenna structure it was not practical for most Signal Corps applications, and the unique circuit design was not appreciated by other Services until late in the war. Concurrently with the work at Western Electric, a project in HF direction finding was active at the National Bureau of Standards. Here, April 18, 1941, a study was approved to investigate errors due to polarization, collector spacing,

etc., to examine and approve DF models, and to develop measuring techniques in the investigation of DF errors. Two reports from this project have become of great importance in DF developments. One is entitled 'High-Frequency Direction Finder Apparatus Research by the National Bureau of Standards, 1941-42,' by Diamond, Lyons, and Poast. The second, by Kenneth Norton, 'The Polarization of Downcoming Ionospheric Radio Waves,' a thorough development of the physics of ionosphere reflections, has become a classic on the subject. A great deal of the subsequent direction-finder development, not only within NDRC, but within the Allied Services as well, is based upon the fundamental theories expounded in these two reports.

Another contract dealing with DF, approved on the same date, was granted to Stanford University for the investigation of compensation in direction finders. Joseph M. Pettit performed the research on compensating loop direction finders against polarization errors. His findings treated the possibilities as well as the difficulties in the development of this highly desirable form of direction finder; as a result further efforts in obtaining polarization-free direction finders ceased for the time, and time and energy were directed along more profitable investigations. At a much later date, June 15, 1945, the Signal Corps referred to an interpretation of Mr. Pettit's report as indicating a favorable possibility for the successful compensation of a loop-antenna direction finder. Under Contract OEMsr-1490, N. Marchand of Federal Telephone and Radio Laboratories performed the necessary computations on material in Mr. Pettit's reports, and showed that only if both loops and dipole antennas had infinite impedance would the compensation of a loop antenna be practical over a range of frequencies for waves of various downcoming angles." (See Abstracts 1227, 2290, and 2424.) "In October 1941, development of a UHF direction finder was approved by NDRC to track radiosonde balloons. Fortunately the need for a simple and dependable method for this was already recognized; the results of this research became the basis for the Signal Corps UHF radiosonde direction finders which were so important in the war. Luke Chia-Liu Yuan of the California Institute of Technology directed the research, in which an Adcock type of direction finder was developed for use in the vertical and horizontal planes. By use of a reflector assembly of conductors a precision of 1/4 degree in the vertical plane was obtained, and 1/2 degree in the horizontal.

Tests of the equipment by the Signal Corps at Fort Monmouth proved the soundness of the basic design from this project. Another direction-finder project which resulted in valuable equipment for the Army was approved by NDRC on January 2, 1942, with Federal Telephone and Radio Corporation. H. Busignies, a French expert who had escaped from the Nazis, recognized the superiority of Adcock antennas over loop antennas and had an idea for making a transportable Adcock system. Under an NDRC contract this was developed into practical equipment which was produced in large quantities by the Signal Corps as SCR-291, and used throughout the world for navigating Air Transport Command planes, as well as for intercepting enemy transmissions.

Prior to this research, all Adcock antennas were cross connected by cables buried several feet below ground to minimize coupling to the antenna elements. Federal Telephone and Radio proved that if the cables were displaced horizontally 32 feet on the surface of the ground the undesired coupling with antennas was reduced as much as by burying them 6 feet. The coupling between the antennas and those cable members which formed the sides of the so-called U connection caused no polarization error. The results were applied to fixed-station instantaneous Adcock direction finders, and the many DAJ direction finders produced for the U. S. Navy had their cross-connecting cables displaced horizontally as well as buried a few feet deep. The highly successful cathode-ray direction finder designed by the National Research Council of Ottawa for the Royal Canadian Navy used this antenna arrangement, and towards the end of the war the British generally recognized the value of this improvement in high-frequency direction finder antenna design. At the same time Federal Telephone and Radio Corporation was developing the transportable Adcock direction finder, Western Electric Company, under a contract, granted February 6, 1942, was performing an important research on the azimuthal deviations of high-frequency radio transmissions.

Karl Jansky undertook to determine the precision of long-distance short-wave direction finding, and in particular to determine the possible advantage of direction finding by using the first wave to arrive in a pulsed transmission. Among his important results was the discovery that the higher frequencies within the sky-wave spectrum provided much more accurate indications of direction. It was also established that particularly on the lower frequencies of this band, such as the tested frequency of 6425 kc., the first arrival of a pulsed transmission was propagated more nearly along the great-circle path than the multiple-reflected wave which arrived later. The pulsed transmissions used in this experiment originated in Puerto Rico and were received on a MUSA system in Holmdel, N. J. While a direction finder of small dimensions was not employed, the results obtained with the large MUSA system indicated accuracies to be expected from an Adcock direction finder at the frequencies investigated, and showed that pulsed transmission would make possible more accurate direction finding in sky waves. The several DF projects mentioned above indicated the need for more refined tests on polarization errors of the antenna systems used in HF direction finders. Accordingly, Dr. D. G. C. Luck of Radio Corporation of America under a contract approved February 6, 1942, and extended May 7, 1943, undertook the development of test procedures and the investigation of errors in various types of Adcock antennas when receiving steeply downcoming waves. Instead of using antennas of a size applicable to sky-wave frequencies, Dr. Luck employed scaled-down systems and transmitted the test signals from an elevated transmitter the frequency of which was too high to be reflected by the ionosphere. An important early discovery was the difficulty of obtaining a wave whose polarisation could be controlled. Every attempt to transmit a purely horizontally polarized wave from the transmitter suspended by a captive balloon resulted in a wave containing components polarized along other axes. Other valuable results included knowledge of the need for a much larger ground mat than had formerly been believed necessary. The effects of radials on ground mats were studied, and the large dimensions which were found necessary to prevent polarization error indicated the value of selecting DF sites with such high ground conductivity that these measures for the reduction of polarization errors would be unnecessary. When Dr. Luck's investigations began to reveal the difficulties to be surmounted in testing direction finders, and the Services were experiencing greater need for evaluating and improving their direction finders, NDRC granted on November 13, 1942, a contract to Federal Telephone and Radio Corporation, entitled 'Study of Direction Finder Fundamentals.' This contract was not limited to one investigation, but was intended to include any research on fundamental direction finding which other NDRC projects might show to be desirable, or which the Services might request. The first investigation by Federal Telephone and Radio Corporation on this project was a measurement of the polarization of downcoming waves from the ionosphere. Several factors made such an investigation appear desirable. In the first place, Dr. Luck's research had shown the inherent difficulties of simulating downcoming sky waves by artificial means. In the second place, unexplainably large errors were observed on direction finders which had been developed earlier by NDRC. In the third place, no experimental verification was available to show distribution of vertically and horizontally polarized components in sky waves. Computations on the ratio of vertical to horizontal wave sensitivity of the recently developed SCR-291 direction finder indicated that if the sky waves were composed of nearly equal amounts of vertically and horizontally polarized energy, the polarization error observed on the equipment's indicator should be very small. Therefore, if the observed swinging of the bearing indication were due to polarization error, one would expect to find much more horizontally polarized wave component than vertically polarized in the ionosphere-reflected signals of operational practice. At the F. T. and R. field laboratory at Great River, N. J., Mr. Busignies installed a polariscope, an instrument which received the vertically polarized and the horizontally polarized waves on two different collector systems. These collectors fed the two stators of a spinning goniometer, and could also feed separate receivers with means for recording the outputs continuously. The National Bureau of Standards' radio transmitting station WWV, at Beltsville, Maryland, was at such a distance from Great River, N. J., that its sky wave caused large errors in most direction finders at that location. This station was therefore chosen as the signal source, and Dr. J. H. Dellinger of the National Bureau of Standards co-operated by transmitting on different antennas at specified times, without at any time interrupting the vital frequency and time standards which WWV supplied through its continuous transmissions. Simultaneously with the reception and recording of these transmissions by means of the polariscope Mr. Busignies observed the behavior of an Adcock direction finder which was well shielded against horizontally polarized waves. By comparing the observations, he hoped to find an explanation of the large swinging of bearing indications on a direction finder which was so insensitive to the undesired component of the wave. These observations were reported on January 5, 1943. They showed that the errors were not due to an unequal distribution of horizontal and vertical wave component. The records indicated a more or less random correlation between the polarization of the sky wave and the swing of the DF bearing; this indicated that the observed errors were not due to errors at the DF site. Only at those periods when the transmissions from WWV were completely horizontally polarized could deterioration of the DF indication be considered due to polarization error. On March 8, 1943, Mr. Busignies presented an hypothesis. In this he showed that the errors could be due only to the interference among multiple-reflected waves arriving at slightly different azimuths. With such an hypothesis the polarization study turned into a verification of the wave-interference error originally described by Heiligtag of Germany, but never before satisfactorily separated from the polarization error. The study showed that further efforts to reduce polarization error in direction finders would not be very fruitful. Since the interference error could not be reduced by any known means on direction finders using small-area antenna arrays, as used in high-frequency direction finders, emphasis could now be placed on more profitable lines of HF DF research, and at last a proper evaluation of the true effects of polarization error reduction could be studied. Coming as it did when both the Army and

the Navy were prepared to spend great efforts in the reduction of polarization errors, the economies effected by this one NDRC research were of vast importance. Further studies, after the investigation was continued under a new contract, included the development of methods for exposing a high-frequency direction finder to artificially produced interfering waves, further theoretical studies on compensated loop-antenna direction finders, and experiments on the possibility of compensating a loop antenna in the special case of a vertically downcoming wave. These had been requested by the Eatontown Signal Laboratories of the Signal Corps. The Signal Corps then abandoned a proposed expensive development program on specially compensated loop-antenna direction finders. Upon the request of the Signal Corps, a study was undertaken under NDRC contracts approved December 12, 1942, for the correlation of DF errors with conditions of the ionosphere. The widespread system of direction finders developed by Division 13 and operated by the Army Air Forces Communication System was now in operational use, and the success of ionosphere predictions for the selections of communications frequencies (presented to operating personnel through an earlier division contract) suggested the value of a similar prediction service for direction finding. This study was distributed among several laboratories, headed by the National Bureau of Standards in Washington. The others were: Stanford University, University of Puerto Rico, Harvard University, and the Carnegie Institution laboratory at College, Alaska. These were selected for their geographical positions as well as for their personnel and equipment. Spaced vertical loop-antenna direction finders were supplied to all. Collection of data begain in the summer of 1943. At the close of the war the correlations between DF errors and ionosphere conditions were not yet useful to operating personnel, but many factors of importance in the operation of a DF network had been discovered. The project was transferred to the Interservice Radio Propagation Laboratory (IRPL) sponsored by both Army and Navy. Because many of the difficulties in the development of DF techniques were confined to the high-frequency range of the radio spectrum, Division 13 had concentrated most of its studies at such frequencies. At higher frequencies it had been assumed that radar practice had satisfactorily solved the fundamental problem of intercept direction finders in the VHF and UHF bands. However, in the spring of 1943 the Signal Corps informed Division 13 that attempts to construct VHF and UHF direction finders along radar lines resulted either in too bulky equipments, or insufficient precision. Because radar practice required the reception of waves with controlled polarization, and did not call for simultaneous indication at all azimuths, it became apparent that the design of intercept direction finders involved difficulties which had not been solved by radar laboratories. Contracts with RCA and Federal Telephone and Radio Corporation were approved May 7, 1943, and May 28, 1943, respectively. RCA undertook the development of a manually rotated, high-sensitivity and high-precision direction finder for the range of 160-600 mc, Federal Telephone and Radio concentrated on the same frequency range, but for a small, less sensitive instrument to provide instantaneous indication at all azimuths. The RCA contract was fulfilled when a report by Blodgett and Lakatos was submitted with the first thorough theoretical treatment and experimental data on polarization studies and antenna-pattern measurements for this range of frequencies. The direction-finder model resulting from this study was selected for use against possible enemy jammers which were anticipated by the NDRC personnel who had developed the vacuum tube fuze. The Federal Telephone and Radio Corporation contract was reported in full March 15, 1945, but before this their model of instantaneous direction finder was selected by the U. S. Navy for use on carriers to cover the aircraft communications band, and was produced as DBF. In September 1944 both the Army and the Navy requested Division 13 to list, with full technical details, all airborne direction finders available and under development. Already the Service laboratories and commercial establishments were duplicating efforts, and there was no source which provided a complete listing of all pertinent information. Since none of the commercial laboratories were in a position to make an unbiased survey, and since outsiders could not have information on the status of the projects, the Technical Aide of the Direction Finder Section of Division 13 was selected to gather information. J. Allison completed this survey November 1, 1944, and since that date several hundred copies have been supplied to meet the requests of the Army, Navy, and British representatives." Principally as a result of the findings of Division 13, there was by early 1945 a considerable reduction of emphasis on the subject of DF instrumentation. Instead, more effort was placed on statistical methods of obtaining the optimum information from the bearings provided by existing DF networks. The British had already become interested in this phase of DF research, and had made available to the United States a great deal of information from statistical studies of bearing accuracies, qualities, and the distribution of errors in DF networks. Our own Navy had performed successful work in this field, and under Captain Engstrom of Naval Operations new forms of DF network mapping and plotting had been developed. However, the actual computation of the most probable location of an intercepted transmitter from the bearings produced a number of direction finders remained a long and difficult operation. This problem also faced the Signal Corps in connection with the determination of areas containing enemy transmitters. After Captain Stuart Martin of the Signal Corps had studies the situation, Division 13 was asked to develop improved mapping and statistical evaluating techniques. The first model of the Evaluator was delivered with a final report September 30, 1945. Thus the Electrical DF Evaluator became the last equipment produced by Division 13; but in common with many other Division 13 developments, this instrument had important postwar applications. Both the Signal Corps and Air Corps have ordered models for use in navigation and weather forecasting. The book also provides a section on the effects of terrain on radio propagation, a section on direction finding on atmospherics (sferics) and describes three observation stations which were set up in and around Albuquerque, New Mexico by the University of New Mexico with both DF and oscilloscopic equipment in each. A review of central communications research is also given.

*(Although the book says "100 and 200 mcs," it is probably a misprint and what is meant is 100 and 200 kcs.)

**As above, probably kcs is correct.

(a-4, b-6, c-1, d-1, e-0, f-Historical Survey)

2904. KESSLER, W. J., "Study of Atmospheric Direction Finding and Ranging," University of Florida, Engineering and Industrial Experiment Station, Gainsville, Quarterly Progress Reports Nos. 1 to 4. See also Department of Commerce Publications Nos. PB108815, 108816, 108817, and 108818; April 1947 to January 1948. ABSTRACT: This report reviews the long range objectives and summarizes the progress achieved to date in connection with the Sferics research program. Reproductions of photographic records are included to disclose the quality of calibration of the Adcock structure. Additional photographs are included to demonstrate the stability of the indicated bearings during diurnal periods and the large variations occurring during nocturnal periods. The improvements and measurements made on the wide-band wave-shape amplifier are reported. Curves and photographs are included to illustrate the characteristics of this amplifier. A brief discussion on the possible necessity for similar transient response of the amplifiers employed at each wave-shape station is included. The reinstallation of the Adcock-loop comparator system is discussed and the modifications and improvements incorporated in the new installation are described. A description of the method of transcribing the data from the film records is given and curves showing the relationship between the indications of the Adcock and loop direction finders are included. A means for collecting information on the "standard wave error" of the Adcock antenna through the use of mutually perpendicular horizontal antennas is discussed. The improvements in the lumped-constant delay line to be used with the wave-shape units are mentioned and design information is presented so that the characteristics of the delay networks employed by each observing station may be made more nearly identical. The present status of the Dotlock control circuit and the final report on the low-frequency ionosphere measurements are also discussed. The modifications to the Adcock-loop comparator antennas in an attempt to reduce the angular variations observed with the Adcock direction finder are discussed. The experimental results of extending the horizontal transmission lines of the Adcock antenna to remove the impedance discontinuities or "end effects" from the immediate neighborhood of the vertical antenna elements are presented. A development of the analytic procedure for the determination of distance and ionosphere height from the data contained in atmospheric wave shapes is included and curves are presented to allow rapid processing of the observable data. (a-?, b-3, c-1, d-1, e-0, f-Study)

2905. KRAUS, J. D., AND WILLIAMSON, J. C., "Characteristics of Helical Antennas Radiating in the Axial Mode," J. Appl. Phys., vol. 19, pp. 87-96; January 1948. ABSTRACT: A helix is a fundamental form of antenna with many radiation modes. A recently reported mode, called an axial or beam mode, occurs for a relatively wide range of helix dimensions, in the region of 0.2 to 0.5 wave-lengths diameter and as high as 0.5 wave-lengths spacing between turns. The radiation is maximum in the direction of the helix axis and is nearly circularly polarized. This mode may persist with a given helix over a considerable frequency range. In this range the phase velocity of wave propagation along the helical conductor is reduced. An approximate expression for the field pattern of a single turn helix is developed. The pattern of a helix of a number of turns is then calculated as an array of such turns. Measured and calculated patterns show good agreement. (a-1, b-1, c-1, d-1, e-0, f-Theory)

2906. PISTOLKORS, A. A., "Theory of the Circular Diffraction Antenna," Proc. IRE, pp. 56-60; January 1948. ABSTRACT: The object of this investigation is a study of the electromagnetic field produced by a diffraction antenna in the form of a circular gap made in a conducting plane. An emf is applied across the gap. The method of investigation is based on the classical diffraction theory by Fresnel and Kirchhoff. The expressions for E and H are obtained and applied to the calculation of electric-field intensity at a great distance, and the directive patterns are plotted. The current distribution in the

screen is then studied, and the expression for the gap admittance is obtained. The surface current density appears as a sum of an infinite number of partials or wave modes. The radiation conductance rises step-wise with increasing radius, like the radiation conductance of an oscillating sphere excited at the equator. (a-3, b-1, c-1, d-1, e-0, f-Antenna theory)

2907. SCHERER, "Partial Report on the Test of the 'Patin' Automatic Direction-Finder Installation," Army Air Force, T-2 Translation No. 1901. See also Department of Commerce PB L87813; January 1948. ABSTRACT: Patin automatic pilot operates on voltage output of direction-finding receiver. Installation is based entirely on relay control. Amplification of voltage is unnecessary. Device is installed in airplane to test ground and flight characteristics and performance. Endurance test was run to furnish data regarding operational safety, length of life, and wear on components. Advantages are given of installation for radio-controlled navigation of airplanes. (a-3, b-3, c-1, d-4, e-0, f-Translation)

2908. WILSON, W.E., "Direction-Finding Kit MX-536/GRD," Federal Telecommunications Laboratories, Nutley, New Jersey, Progress Reports Nos. 10-11, TIP No. U1074; December 1947 - January 1948. ABSTRACT: Preliminary tests on the VHF antenna assembly indicated that the single shielded RF cable is unsatisfactory because of excessive pickup energy. The use of RG-13U or 9U double-shielded 52 cable is being considered. Diagrams of components are shown. (a-3, b-3, c-1, d-1, e-0, f-Modification)

2909. BELL, D. A., "Slot Aerials," Wireless World, pp. 57-58; February 1948. ABSTRACT: Electrical properties and practical applications of slot antennas are discussed. They have the advantage of having polarization at right angles to that of a dipole, so that it can be incorporated in a conduction structure. If a row of spaced holes is placed in the side of a waveguide, each hole will radiate some of the energy passing down the guide; uniform phasing of the radiation from the holes is effected by spacing them correctly along the length of the guide. The optimum type of radiating hole in a waveguide is a slot of about half a wavelength and of much smaller width. A slot in an infinite sheet is closely equivalent to a flat-strip dipole in free space, except that the slot behaves as a magnetic dipole, with the magnetic field parallel to the length of the slot. (a-3, b-2, c-1, d-5, e-0, f-Analysis)

2910. DELLINGER, J. H., AND SMITH, N., "Developments in Radio Sky-Wave Propagation Research and Applications during the War," Proc. IRE, pp. 258-266; February 1948. ABSTRACT: This paper discusses the work done by the Interservice Radio Propagation Laboratory during World War II. The circumstances leading to the establishment of IRPL are described, and the problems which were faced are stated. The measures taken for the solution of these problems are outlined, and some of the results are presented. Specific services performed by IRPL during the war for the armed forces and commercial companies are recounted. (a-3, b-1, c-1, d-1, e-0, f-Survey)

2911. GRIPPS, G., "The Absorption of Radio Waves in the Ionosphere," Proc. IRE Australia, pp. 11-15; February 1948. ABSTRACT: A brief description of the ionosphere is followed by an outline of the factors affecting the propagation of radio waves, including ionospheric reflection. Attention then is directed to the phenomenon of absorption of radio waves by the ionosphere and it is pointed out that normal ionospheric absorption is made up of two components. Expression for the normal absorption coefficients at vertical incidence are presented. Reference also is made to abnormal absorption conditions such as those causing fade-outs of radio transmission. The practical case of oblique incidence is then considered and the factors underlying the selection of the lowest and highest usable frequencies are examined. The paper concludes with data on methods of absorption measurement and the equipment requirements involved. (a-3, b-1, c-1, d-11, e-0, f-Propagation)

2912. MEYERS, J. J., "Bibliography of Classified and Unclassified Reports on Radio Direction Finding," University of Illinois, Radio Direction Finding Research Group, Technical Report No. 3; February 1948. ABSTRACT: A Bibliography of reports pertaining to direction-finding. It is one of three reports. Other reports pertained to publications and patents. See Abstracts Nos. 2842, 2874, and 2944. (a-4, b-3, c-1, d-1, e-188, f-Bibliography)

2913. KIRKMAN, R.A. AND LEBEDDA, J. M., "Meteorological Radio Direction Finding for Measurement of Upper Winds," J. Meteor., pp. 28-37; February 1948. ABSTRACT: The course of development of Army radio equipment (at the Signal Corps Engineering Laboratories) for the measurement of upper wind velocities is reviewed. It is indicated that this type of information is needed for the successful navigation of aircraft, for weather predictions, and for the determination of ballistic winds used in connection with artillery fire. Operation of the two latest types of direction-finders, for upper wind measurements up to 100,000 ft altitude, is described in some detail, and performance data are given. Sources of error in connection with accuracy measurements are discussed quantitatively. Standard angular errors of the apparatus considered are in the range from 0.05° to 0.15°. (a-3, b-1, c-1, d-1, e-0, f-Description)

2914. THOMPSON, A. G., "Evaluation Report, AN/ARD-4, Serial No. 1, VHF Airborne Radio Direction Finder," NRL Report R-3242, ASTIA No. AD-469855; 18 February 1948. ABSTRACT: Supplementary tests were made on the AN/ARD-4 direction finder equipment, and reference is made to previous tests made by other organizations upon Models DBF and AN/ARQ-6 equipments, which are nearly identical to the AN/ARD-4. Flight test data were not obtained because of lack of adequate flight facilities. These supplementary investigations verified the suitability of the equipment for airborne use, evaluated some modifications of the original Model DBF antenna system, and brought out several minor deficiencies not previously reported. It is judged that the equipment will meet essential contract specifications upon the execution of several recommendations. (a-3, b-3, c-1, d-1, e-0, f-Test and evaluation)

2915. ZINKE, O., "Theory and Techniques of Antennas - Part II - Broad-Band Antennas, Transformers and Cables, AMC Intel. Report No. F-TS-2223-RE; February 1948. ABSTRACT: A comprehensive survey of antennas and their associated coaxial cables and line transformers for broad-band antenna installations is presented. During the way, broad-band operation was necessary so that the frequency could be changed to intercept enemy messages and to eliminate interference, either from the enemy or from neighboring transmissions. Broad-band antennas are considered to be those which do not require mechanical change or mechanical tuning during the frequency change. Electrically, the broad-band antenna should retain its radiation pattern and the matched condition of the antenna resistance to the wave impedance of the connecting cable from the transmitter or receiver. (a-3, b-3, c-1, d-4, e-0, f-Antenna theory)

2916. SILBERSTEIN, R., "Radio Propagation Effects on High-Frequency Direction Finders. Phase I, Experimental, Phase II. Literature Survey," Central Radio Propagation Lab., National Bureau of Standards [Signal Corps Contract No. 5055-PH-47-91 (6753); Quarterly report no. 4];1 Oct - 31 Dec , 1947; TIP No. U425; 1 Feb 1948. ABSTRACT: A laboratory test was made on a complete two-channel system for measuring phase differences between two arriving waves. Sources of error were noted and modifications made. The literature survey consists of abstracts of two papers: "The Polarization of Downcoming Ionospheric Radio Waves," and "High-Frequency Direction Finder Apparatus Research by National Bureau of Standards, 1941-2," (final report of OSRD project C-18). (a-3, b-3, c-1, d-1, e-0, f-Propagation study and literature review. See also Abstract No. 2945)

2917. EVERHART, A. G., "Direction-Finding Kit MX-536/GRD," Federal Telecommunications Laboratories, Nutley, New Jersey, Progress Reports Nos. 12-13, Project W28-099-ac-27; TIP No. U1075; February-March 1948. ABSTRACT: The Status on the various components of the DF kit is described. Photos are shown of the master power supply. (a-3, b-3, c-1, d-1, e-0, f-Modification report)

2918. FEWINGS, D. J., "Marconi Multi Channel Visual HF Direction Finder Type DFG 28," Marconi Rev., vol. 11, pp. 1-8; January to March 1948. ABSTRACT NO. 1: A single spinning goniometer without range switching provides bearings on four channels for frequencies between 3 and 17.5 Mc. The channels are independent both for bearings and for sense and all may work simultaneously, bearings being shown on cathode-ray tubes with linear scales. Spaced vertical mast antennas of the Marconi Adcock type are used with buried feeders; no vertical sense antenna is necessary. A signal-to-noise ratio of 20 db is obtained with signal strengths varying between 0.5 and 6 λv/m. The case containing the goniometer and driving motor is specially designed to reduce noise. ABSTRACT NO. 2: Spinning goniometer type of direction finder operates on four channels in frequency band 3-17.5 mc with each channel independent both for bearings and for sense, and all able to work simultaneously; four Marconi type CR 150 receivers

employed; constructional and circuit details. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Description)

2919. GRIMM, R., "The Comb Antenna," Proc. IRE, pp. 359-362; March 1948. ABSTRACT: An analysis of a comb antenna for reception of vertically-polarized medium-frequency waves is given. The formula can be applied to any array in which the elements are arranged in a line and in which the current ratios and phase relations are known. Close coupling of the elements is considered, rather than very loose capacitive coupling. The condition of close coupling greatly increases the directivity and signal level by adjusting the line velocity to an optimum value. The antenna is especially suited for reception of Loran signals. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

2920. MC ILWAIN K., AND WHEELER, H. A., "The Propagation of Radio Waves thru the Ground," Proc. IRE, vol, 36, no. 3, p. 377; March 1948. ABSTRACT: Summary of technical papers: A theoretical and experimental study of the propagation of radio waves through ground has resolved certain inconsistencies in prior work. Tests covered depths to several hundred feet and frequencies from 0.6 to 1000 Mc. As expected, dry ground is better than wet. At the lower frequencies, ground behaves as a homogeneous, poorly conducting medium; at the higher, the rate of attenuation increases much more rapidly, indicating pockets of moisture separated by dry ground. A special technique has been used to test the horizontal propagation through substrata, which is especially useful to detect and trace dry layers sandwiched between wet layers. The results show the limitations of radio waves for deep geophysical prospecting, though they may be useful for related exploration. (a-4 and 5, b-1, c-1, d-1, e-0, f-Summary)

2921. RAMSAY, J. F., "Fourier Transforms in Aerial Theory," A six part paper beginning in the Marconi Rev., vol. 9, no. 83, pp. 139-145, October to December 1946, and continuing one part per quarter ending with Part VI, vol. 11, no. 89; January to March 1948; March 1948. ABSTRACT: Part I. Introduction; Fourier Cosine Transforms: The object of this article is to show how the Fourier Integral and Fourier Transforms can be used for the calculation of polar diagrams from aperture characteristics. The radiation pattern of a narrow-beam aerial can be formulated as the Fourier Transform of the aperture excitation. Examples are given of simple equiphase aperture characteristics and the evaluation of the corresponding polar diagrams. Four basic patterns are plotted, corresponding to the symmetrical, in-phase excitations known as "constant," "triangular," "cosine," and "cosine squared." Part II. Fourier Sine Transforms: In the first part of this article, appearing in the last number of the Marconi Review, it was shown that Fourier integrals could be used for the calculation of polar diagrams, from aperture characteristics. The transforms of the Fourier integral can assume either a cosine or sine form depending on whether the complex amplitude distribution is even or odd. Four types of cosine functions were treated in the first part of the article and here the corresponding sine functions are discussed. Part III. Operations with Fourier Transforms: Certain elementary operations with Fourier Transforms are reviewed. These are: 1. Change of sign of the independent variable, 2. Interchange of Function, 3. Identity of Function. Self-Reciprocal Transforms, 4. The Gaussian and Rayleigh Transforms, 5. Even and Odd Functions, 6. Real and Imaginary Parts. Complex Conjugates, 7. The Displacement Theorem, 8. Multiplication by a Constant, 9. Change of Scale, 10. Addition and Subtraction, 11. Differentiation of Transforms, 12. Transform of a Product. These operations can be applied to describe the properties of linear radiators. Part IV. Fourier Approximation Curves: Fourier approximation curves are shown for a rectangular waveform, and the existence of the Gibbs' phenomenon is pointed out. The transition from Fourier Series to the Fourier Integral is shown graphically by finding the frequency spectrum of recurrent waveforms with gradually lengthening period, ending with a single pulse, the spectral envelope of which is the Fourier Transform of the pulse. By a change of notation the transient analysis of circuit theory can be interpreted as the Fourier Transform theory of aerials, aperture distance replacing time, and pattern co-ordinate replacing frequency. The approximation curve to a rectangular pulse obtained by restricting the frequency range of the spectral envelope is used as an example of a Fourier Transform approximation curve. An application of the reciprocity theorem and a change to aerial co-ordinates enables the aperture distribution to be found appropriate to a "sectoral" beam. Part V. Fourier Approximation Curves: A study is made of a beam having a sharp and a blunt side. This asymmetrical pattern is partitioned into its even and odd components, each of which have Fourier approximations. The aperture excitations, in the form of "mutilated" functions, are determined to provide these approximations. One aperture has a real even distribution, the other an imaginary (i.e., quadrature)odd distribution. These together provide the complex distribution suited to produce the asymmetrical pattern. The approximation pattern is also obtained without resorting to a partition by the use of the Dirichlet type of integral. A second example is concerned with the Fourier approximations to the "lobe-less" Gaussian radiation pattern. Part VI. Conclusion: The previous articles of the series are reviewed and further developments indicated. A list of references for further reading is given using the classification: (1) Mathematical Sources for Fourier Transforms; (2) Electromagnetic Radiation; (3) Narrow-Beam Aerials; and (4) Fourier Transforms in Communication Theory. (a-1, b-1, c-1, d-1, e-299, f-Antenna theory)

2922. PARKER, C. V., "Characteristics of Directional-Null Antenna Patterns Produced by Multi-Element Arrays," NRL Report R-3245; 1 March 1948. ABSTRACT: The analysis of directional-null antenna design begun in NRL Report R-3162 is extended to arrays of omnidirectional elements. Symmetrical arrays of four and six elements each are considered in some detail with equations derived for the power radiated, equivalent radiation resistance, slope of the central null, angular positions of minima, maxima, and nulls, and the amplitude of the maxima relative to the minima and also relative to the peak of the in-phase pattern having the same current distribution and element spacing. It is concluded that null-type antenna patterns may be obtained that are entirely free of nulls except in a chosen plane through the antenna by a suitable choice of element spacing and current, and, furthermore, that the depth of minima may be controlled by the same means. In particular, it is shown that, in the case of a four-element array of this type, the only requirement is that the current distribution be tapered from the center outward and that the element spacing be less than one wavelength. Arrays of eight or more elements are more briefly considered with similar conclusions. This analysis developed as a by-product of work on Problem 34R03-06. Work is continuing on other phases of the problem. (a-1, b-3, c-1, d-1, e-394, f-Analysis)

2923. CONLON, J.J., "Evaluation of Model X-DBH Radio Direction Finder," NRL Report R-3259. See also Department of Commerce PB-109573; 16 March 1948. ABSTRACT: Laboratory and field tests indicate that the X-DBH MF/HF direction finder which covers the range of 0.25 to 30 Mc. is satisfactory. In the event full scale production is contemplated, certain minor improvements in electrical and mechanical characteristics, as noted, are desirable (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

2924. BROWN, C.R., AND AUGENBLICK, H.A., "Bibliography of Circular Polarization, Unclassified and Restricted Literature," Federal Telecommunications Laboratories, Nutley, New Jersey, Interim Report, Contract No. N5sr-11772, Task No. 11.4-A; TIP No. R957; April 1948. ABSTRACT: Abstracts of 38 reports are arranged according to the following types of antennas: crossed dipole and fish-hook, stub or dipole and loop, horn, helical, and miscellaneous. The 4 major types and 2 of the miscellaneous are shown in diagrams. An alphabetical list of titles is included. (a-3, b-3, c-1, d-1, e-9, f-Bibliography)

2925. FRATIANNI, S. V., "Theory and Design of Resonant Transformer-Coupled Loop-Antenna Input Systems for VLF Reception," NRL Report R-3281. See also Department of Commerce PB129287; April 1948. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

2926. HANSEL, P. C., "Instant-Reading Direction Finder," Electronics, vol. 21, pp. 86-91; April 1948. ABSTRACT NO. 1: Four omnidirectional vertical collectors are equally spaced around a horizontal circle. Their outputs are independently modulated in balanced modulators, the signals from alternate antennas being modulated in quadrature. The resulting carrier-suppressed signals are then combined in a common impedance, the angle of arrival being a function of the phase of the lf envelope. Direction is indicated on a cr tube phase-meter. Sense can be determined visually by means of a single switch. Provision is made for spitting the directivity-pattern in the case of weak signals, to give better resolution. Several receivers can use the antennas at the same time. ABSTRACT NO. 2: A description of the 0.54-30 Mc/s U.S. radio set AN/CRD-2. Each of 4 vertical aerials, in square formation, feeds a balanced modulator at the base of its 30 ft mast. Modulation is at 147 c/s and in quadrature and the 4 signals combined constitute the output of an aperiodic electronic goniometer. At the presentation rack, which can be up to 1000 ft distant, a 200 kc/s oscillator is modulated by the amplified and rectified output from the goniometer and passed to 2 balanced modulators where modulation is in quadrature at 147 c/s again occurs, the output being taken to a c.r.t. The resulting propeller-shaped pattern indicates signal direction. Sensing and bearing-splitting are possible and multiple operation as well, if the goniometer is fed to

several presentation racks. ABSTRACT NO. 3: The heart of this new direction finder is an electronic goniometer circuit that modulates incoming signals with angle-of-arrival intelligence. Bearings are indicated by a propeller-shaped pattern on a cr tube screen. Switch-operated circuits produce sense indication or a split bearing pattern, to indicate accurately the directions of weak signals. (a_1-6, a_2-5, a_3-3, b-2, c-1, d-1, e-0, f-Description)

2927. JORDAN, E.C., "Direction of Arrival of Radio Waves," University of Illinois, Radio Direction Finding Research Laboratory, Summary Technical Report No. 4, TIP No. U3373; 14 April 1948. ABSTRACT: A wave interference study is being made to determine the information necessary to resolve the component waves. The effects of pickup antennas on the interference pattern indicated that wide-aperture antenna systems (extending over several wave lengths) are necessary for accurate separation of the waves. An investigation of ordinary crossed-Adcock (small-aperture) systems revealed that these systems do not utilize all the information available. With suitable antenna connections, it is theoretically possible to obtain sufficient information from a small-aperture system to separate out 2 waves. A study of the "super-gain" antenna array showed that due to extremely low effective radiation resistance, such arrays are not practical for direction-finder use. The Doppler-effect system and a wide-aperture system are also discussed. (a-3, b-3, c-1, d-1, e-0, f-Propagation study)

2928. TAI, C. T., "Coupled Antennas," Proc. IRE, vol. 36, pp. 487-500; April 1948. ABSTRACT: The integral equation governing the current distribution on two coupled antennas has been solved. The method used is an improvement on the work originally formulated by King and Harrison. As a result of this improvement, the general solution pertaining to the antenna problem reduces to the conventional one obtained from transmission-line theory, when the two antisymmetrically driven antennas are closely coupled to each other. Numerical values of the self- and mutual impedances based upon the present work have been computed. The result is compared with those obtained by Carter based upon the so-called emf method, assuming a sinusoidal distribution of the currents. The problem of finding the current distribution and impedance characteristic of a center-driven antenna is, in general, a problem of how to find a solution of the three-dimensional vector wave equation that satisfies the specified boundary conditions. Unless the body of the antenna as a whole can be well defined by one appropriate co-ordinate in some co-ordinate system - as, for example, a prolate speroid - no general method is so far available in the sense that solution would satisfy the boundary condition at every part of the body, including, for instance, the end surfaces of a cylindrical antenna or those of a biconical antenna. Hallén's vector potential method in dealing with the cylindrical antenna is a very satisfactory one because the end effect in such a formulation is negligible, while mathematically it permits reduction of the analysis into a one-dimensional form. Moreover, this method is especially appropriate for handling the problem of coupled antennas. The present work is an improvement on the method originally formulated by King and Harrison. The improvement is twofold. In the first place, a proper distribution function has been chosen in expanding the integral equation as was done in the case of a single antenna, and secondly, the term corresponding to the contribution of the vector potential by the second antenna is treated as part of the main integral instead of as a correction term. Results derived from the present method show that, in the case of two coupled antennas driven antisymmetrically, the solution reduces exactly to the conventional one obtained from transmission-line theory, when the two antennas are sufficiently close to ratisfy the conditions of line theory. (a-1, b-1, c-1, d-1, e-0, f-Theory)

2929. WATERMAN, P., KEY, JR., C.L., AND DODGE, C.H., "Proposed Constant True Bearing Homing System for Skylark," NRL Report R-3280, April 1948. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Systems proposal)

2930. WISE, W.H., "Potential Coefficients for Ground Return Circuits," Bell System Tech. J., vol. 27, pp. 365-371; April 1948. ABSTRACT: The paper is mainly concerned with theoretical computation of the effects of finite conductivity in ground return circuitry. Formulae are derived taking into consideration this conductivity and dielectric constant of the earth, and the potential coefficient representation V/Q. The real object of the paper is to derive the complete expression for the true coefficient as adversed to the close approximation, V/Q. (a-4, b-1, c-1, d-1, e-805, f-Theory).

2931. STOFFREGEN, W., "Distant Localization of Individual Atmospherics with a Cathode-Ray Direction-Finder of Unidirectional Type," Ark. Mat. Astr. Fys., vol. 34, part 4, section A, p. 14, 13 April 1948. ABSTRACT: An improved form of cathode-ray direction finder is described in which a "sense antenna" eliminates an uncertainty of 180° by blacking out the negative half-cycle. Radar technique is used to determine the range. (a-6, b-1, c-1, d-0, e-0, f-Description)

2932. ANONYMOUS, "Evaluation of a Production Model DBF-1 VHF D/F Equipment on an Aircraft Rescue Vessel (AVR 104' Class)," U.S. Fleet, Operational Development Force, Final Report; TIP No. R485; 20 April 1948. ABSTRACT: A production model of the DBF-1 VHF direction finding equipment was operationally tested on an Aviation Rescue Vessel of the 104 foot class, to determine the capabilities and limitations of the equipment. Investigation to determine bearing accuracy, reliability of sense indication, effects of antenna locations, minimum and maximum ranges and the effects of adjacent channel operation were conducted. It is recommended that the DBF-1 be accepted for service use and be installed in the CIC of those fleet units concerned with aircraft control. (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

2933. BOOLBA, P. M., DUBBE, E. C., MYRBECK, E. R., SCHWETMANN, H.D. AND G. WORSLEY, "Final Report on Direction Finder Type Tests," Cruft Laboratory, Harvard University, Cambridge, Massachusetts, Technical Report No. 19, Published for Office of Naval Research, Contract N5ori-76, Task Order No. 1, TIP No. U2861; 25 April 1948. ABSTRACT: The material covered in this report deals with the testing of four direction-finders, namely, SCR-502, AN/CRD-2, SCR-551, and SCR-503. The tests were performed in accordance with the National Defense Research Committee's "Standard Direction-Finder Measurements, Provisional Draft of July 11, 1945." The extent to which these tests were carried out is explained in sections 2 to 11. The emphasis has been placed, in these tests, on measurements of maximum response sensitivity, bearing sensitivity, bearing accuracy and bearing error due to polarized waves down-coming at 45 degrees. The range of frequency covered by these tests was from 100 Kc/s to 20 Mc/s. Where comments and recommendations have been made for changing the testing procedure, they have been entered in the appropriate sections. (a-1, b-3, c-1, d-1, e-31, f-Experimental testing)

2934. KESSLER, W. J., AND KNOWLES, H. L. "Direction Finder for Locating Storms," Electronics, vol. 21, pp. 106-110; May 1948. ABSTRACT NO. 1: Two perpendicular loop antennas feed the vertical and horizontal deflecting plates of a cr tube through separate amplifiers. The bearing of lightning flashes is thus indicated directly. ABSTRACT NO. 2: The equipment, which operates at 10 kc/s, consists of 2 frame aerials at right angles, feeding through matched amplifiers to the X- and Y-plates of a crt. Each frame has an inductance of 0.22 H, a distributed capacitance of 140 μμF and a Q-factor of 40. Each amplifier consists of a cathode-follower feeding through an RC-coupled and a tuned stage to a final stage transformer-coupled to the deflecting plates. Regulated power supplies are used. Good matching as regards gain and phase shift is essential and the calibration and adjustment procedure is explained in detail. Angular orientation on the crt can be determined visually or photographically. Storm centres are located by triangulation using 3 or 4 such stations. (a_1-6, a_2-1, b-1, c-1, d-1, e-0, f-Description sferics)

2935. RIBLET, H. J., "Note on the Maximum Directivity of an Antenna," Proc. IRE, pp. 620-623; May 1948. ABSTRACT: It has been shown by Bouwkamp and deBruijn that the directivity of a linear current distribution of fixed length may be made arbitrarily large. By a slight extension of their arguments, the same conclusion is demonstrated for a two-dimensional current distribution and for a distribution of current on an infinite strip. (a-3, b-1, c-1, d-1, e-0, f-Theory)

2936. JOUGUET, M., "Wave Propagation in a Guide of Nearly Circular Section," Compt. Rend. Acad. Sci. (Paris), vol. 226, pp. 1436-1438; 3 May 1948. ABSTRACT: Detailed discussion of the principal and secondary effects of slight deformation of a waveguide from an exactly circular shape shows that all waves resulting from an E_o wave in the circular waveguide, except the E_o and H_o waves, are unstable. Numerical calculation shows that the effects of the instability are considerable. As regards the secondary effects, each of the two waves which correspond to a given wave can be regarded as the superposition of a principal wave of the same type and of perturbations of small amplitude. (a-6, b-1, c-3, d-3, e-0, f-Waveguide theory)

2937. JOUGUET, M., "Properties and Applications of Waveguides of Oval Section," Compt. Rend. Acad. Sci. (Paris), vol. 226, pp. 1515-1517; 10 May 1948. ABSTRACT: By use of a section of nearly circular waveguide of suitable length and cross section, a wave with plane

polarization can be transformed into a wave of the same type, but with the plane of polarization rotated through any required angle. A plane-polarized wave can also be transformed into one with elliptical polarization of any ellipticity. Applications are described in which these principles are used for the transmission of waves round elbows of any total angle. The remarkable property, that the attenuation of H_0 waves decreases with increase of frequency, does not hold when the waveguide section ceases to be exactly circular, because the least deformation of the cross section of the waveguide causes a longitudinal current to appear, with a consequent attenuation which increases with frequency. (a-3, b-1, c-3, d-3, e-o, f-Waveguide theory and application)

2938. BOUWKAMP, C. J., "On the Theory of Coupled Antennae," Phillips Res. Rep., vol. 3, pp. 213-226; June 1948. ABSTRACT NO. 1: A treatment of coupling between two identical, parallel, perfectly conducting cylindrical wires, separated by a distance large compared with the radius of either, and each fed at the center by a "slice" generator. Approximate integral equations are obtained and solved for the currents in the two wires. Expressions are then derived for the input and mutual impedances. Some functions involved in the problem are tabulated. ABSTRACT NO. 2: The purpose of this paper is to provide formulae for the self and mutual impedances of an antenna system consisting of two identical, centre-fed, parallel, cylindrical wires. Tables of auxiliary functions are given facilitating numerical investigation in the range $1 < 2\pi l/\lambda < 2$, $0 < d/l < 2$, $\Omega = 2\ln(2l/a) > 10$, where $2l$ is the length of each antenna, d their mutual distance, $2a$ the wire diameter, and λ the wavelength. Examples illustrating the general theory are deferred to a subsequent paper. (a_1-3, a_2-1, b-1, c-1, d-12, e-0, f-Theory)

2939. BUSIGNIES, H., "New Developments in Marine Radio Direction Finders," Elec. Commun. (London), vol. 25, pp. 196-203; June 1948. ABSTRACT NO. 1: A general review presented at the International Merchant Marine Radio Aids to Navigation Conference, New London, Conn., 1947. Suggestions for improvement include: (a) use of other wave-lengths, (b) use of pulse transmissions, (c) direction-reading indication of bearings, (d) combination of distance measurement and bearing. ABSTRACT NO. 2: A review of the past and present state of marine direction finding and a comparison of its merit and fields of application with those of radar and loran. Reasons for lack of progress in measurement technique are considered and factors that seem to limit further progress are reviewed. Suggestions for improvement are: use of other parts of the frequency spectrum, pulse transmissions to reduce night effects, direct reading indication of bearings and combination of distance measurement with bearing measurement to obtain a fix from only one beacon station. (a_1-3, a_2-3, b-1, c-1, d-5, e-0, f-Summary - past/present)

2940. GAZZANA-PRIAROGGIA, P. "Input Impedance of a Non Uniform Transmission Line," Alta Frequenza, vol. 17, pp. 99-109; June 1948. ABSTRACT: Discusses the hypotheses on which the approximate theory of such lines is based and gives a new method for calculating the input impedance of a line with slight irregularities. Results thus obtained are compared with those of other authors. (a-3, b-1, c-9, d-9, e-0, f-Theory [multi-language summary])

2941. ROSS, W., AND BURGESS, R. E., "H-Type Adcock Direction Finders," Wireless Eng., vol. 25, pp. 168-179; June 1948. ABSTRACT: The results of specific experiments are combined with the general experience gained in several years' work with these hf direction finders (3 to 30 Mc) in this survey of the important factors in their design. The main conclusions are: (a) For maximum sensitivity, the ratio of antenna capacitance to total parallel antenna-circuit capacitance, and the dipole effective length, must both be as large as possible; the dipoles should, therefore, be end-loaded. (b) Coupling circuits between the antennas and the first tube of the receiver must be such as to ensure (i) a high coefficient of coupling in all transformers and goniometers, (ii) as few intermediate circuits as possible, (iii) resonance of the primary inductance of the antenna transformers (or goniometer field coils) with the total antenna-circuit capacitance just outside the hf end of each frequency band, (iv) coverage of the total working-frequency range in a series of subranges each of the order of 1.5 to 1 in frequency. (c) Antenna-circuit balancing becomes extremely critical near the fundamental resonant frequency of the central column formed by the down leads or supporting column. (d) The presence of an operator can cause serious bearing errors in small rotating-antenna systems, whatever his position, especially when the bearings are flat. (e) The image in the ground of the horizontal conductor formed by the feeder lines gives rise to an inherent polarization error which is only important when antenna height is small compared to antenna spacing. (f) The presence of the receiver box between or near the lower halves of the dipoles can cause polarization error. (g) Other sources of polarization error exist which are as yet unexplained. (a-1, b-1, c-1, d-5, e-0, f-Experimental analysis)

2942. STIFLER, JR., W. W., AND SAARS, W. F., "Sofar (Sound Fixing and Ranging)," Electronics, vol. 21, pp. 98-101; June 1948. ABSTRACT: A hyperbolic position-fixing system depending upon the propagation of sound from a small bomb exploded at a critical depth in the ocean. With a combination of three or more receiving stations, the system gives a fix accurate to within 5 miles at a range of 2000 miles. Continuous-monitoring equipment, used to time the arrival of impulses, is described, with sample records. (a-3, b-2, c-1, d-1, e-0, f-Description)

2943. GILVARRY, J. J., "Einstein's Equivalence Principle and the Problem of Blind Navigation," Phys. Rev., vol. 73, pp. 1409-1410; 1 June 1948. ABSTRACT: The importance of Einstein's equivalence principle in the problem of blind navigation of aerial or space vehicles has been appreciated for a long time. A formulation of the limitations this principle imposes in the practical solution of the problem has, however, never been published. The following discussion assumes a vehicle having no radiation connection with the earth and confining an observer who is posed with the problem of determining the vehicle's position with respect to the earth purely by dynamic measurements. A dynamic measurement is defined as a force measurement on a proof body, or a measurement of acceleration, velocity, or displacement on such a body. The gravitational field in the neighborhood of the vehicle is assumed locally uniform, and Newtonian mechanics is assumed. The forces acting on the vehicle can be analyzed into three sets: forces, whose sum is F, due to external, nongravitational forces on the vehicle; forces, whose sum is L, due to the reaction on the vehicle of the internal forces exerted on a proof body; and forces, whose sum (per unit mass) is g, due to the gravitational attraction of all other mass. The equivalence principle is frequently interpreted to imply that no dynamic experiment made by an observer within a windowless box can discriminate between a gravitational field due to attracting matter and the apparent field due to an acceleration of the box. This categorical interpretation is obviously too restrictive, since the procedure outlined above of solving for R, which yields g, is always possible unless the hypothetical observer is confined to the windowless box throughout all time. (a-1, b-1, c-1, d-1, e-0, f-Theory)

2944. RADIO DIRECTION-FINDING RESEARCH GROUP, "Abstracts of U.S. Patents on Radio Direction Finding," University of Illinois, Department of Electrical Engineering, Radio Direction Finding Research Laboratory Technical Report No. 5; Contract N6-ori-71, Task Order XV, for the Office of Naval Research; 1 June 1948. ABSTRACT: These abstracts of U.S. patents, relating to direction-finding systems considered to be non-cooperative, i.e., one in which the finding of direction does not depend on cooperation between the transmitter and the direction finder, were taken from the Official Gazette of Patent Office (U.S.). All direction-finding patents up to June 1, 1948, are listed herein with the exception of a few very early ones (prior to about 1928). The patents are arranged numerically by the patent number appearing in the upper right-hand corner of the space provided for the individual abstracts. The pages are marked with two horizontal black lines, where they may be cut to provide for filing in a standard 5" X 8" file cabinet. The assignee, where it is other than the author, is listed immediately below the word Assignee in the middle of the top of the spaces. In some cases, in order to get the entire abstract in the space provided, the abstract has been shortened by deleting the last part; an attempt has been made to cut the abstract at a point where the meaning will not be materially altered. (a-1, b-3, c-1, d-1, e-214, f-Abstracts of patents)

2945. SILBERSTEIN, R., "Radio Propagation Effects on High Frequency Direction Finders; Phase I. Experimental," National Bureau of Standards, Central Radio Propagation Laboratory Quarterly Report No. 5, Contract No. 5055-PH-47-91(6753), (TIP No. U2930); 15 June 1948. ABSTRACT: A gate pulse unit was constructed for separating the desired pulse of a receiver pulse group and for examining portions of the desired pulse. Investigations were made of the sources of error in the twin-channel receiving system. Laboratory tests were made of the over-all stability of the 2-channel system. The inputs of the 2 receivers were connected in parallel across a standard voltage generator, the goniometer position was oriented to some convenient phase reading on the oscilloscope, and the gains were equalized in the 2 channels so that the sum-and-difference ellipse was closed into a straight line. Any phase change would be indicated by a shift in the orientation of the line and any amplitude change by the formation of an ellipse from the line. After the power had been on for 3 hrs, the subsequent drift between hourly periods of readjustment was negligible. The derivation of sky wave radiation patterns for a perfect or an imperfect earth is given in the appendix. (a-3, b-3, c-1, d-1, e-0, f-Propagation study. See Abstract No. 2916)

2946. KELLEHER, K. S., "Analysis of Antenna Wavefronts," NRL Report R-3329, July, 1948. See also Department of Commerce PB113039. ABSTRACT: An investigation is conducted of the wave-front produced by a line source parallel to the elements of a general cylindrical surface. The wavefront in planes perpendicular to the line source is obtained in parametric form in terms of the reflector curve and the position of the source. For a parabolic reflecting curve, the optimum off-axis source position is considered; the connection between the source position and the direction of propagation of the wavefront is established; and the application of these wave-fronts to the calculation of the radiation characteristics of a parabolic reflector with off-axis feed is developed. (a-1, b-3, c-1, d-1, e-150, f-Analysis)

2947. MATHERS, G. W. C., "Goniometer Test Apparatus," U. S. Department of Commerce, PB94577; July 1948. ABSTRACT: 14 pages of photos, drawings, diagrams, graphs, and tables. It describes the apparatus being used at the National Research Council of Canada for the accurate determination of the angular cyclical error in goniometers. Details of construction and design are outlined and an analysis is given of the possible sources of error and their corrections. The maximum error in the test apparatus is shown to be approximately 0.03 degrees. (a-4, b-3, c-1, d-7, e-0, f-Test equipment).

2948. PEAT, J. D., "The Influence of the Human Element in Direction Finding," Marconi Rev., vol. 11, pp. 69-77; July to September 1948. ABSTRACT NO. 1: Discussion of the accuracy of direction-finding bearing observations in the 1 to 20-Mc band and of a method of eliminating human errors by means of a recording device. Results obtained by visual, aural, and recorded observations on typical transmissions are compared statistically. ABSTRACT NO. 2: The human factor in operating D/F equipment is one of the three basic sources of error and its effect may be evaluated by using an automatic recorder, comparing with manual results and applying standard methods of statistical analysis. Details are given of an investigation for aural, visual and automatic records taken on a 1-20 Mc/s equipment, and it is concluded that the accuracy is degraded only slightly by the human factor. The recorder may have other advantages, however, in routine D/F work. (a_1-5, a_2-3, b-1, c-1, d-5, e-0, f-Evaluation)

2949. PRESSEY, B. G., "The Measurement of Errors in Radiogoniometers at High and Very High Frequencies," JIEE (London), part III, vol. 95, pp. 221-228; July 1948. ABSTRACT NO. 1: Description of three methods of error measurement which all involve the application of two signal-frequency voltages of known ratio r, one to each field coil of the goniometer. The goniometer reading for minimum search-coil output is compared with the true angle $\tan^{-1}r$. The accuracy of the methods if discussed and details of the construction and calibration of the apparatus are given. Typical error measurements made on various goniometers are shown. ABSTRACT NO. 2: Existing methods of measuring the instrumental errors in inductive radiogoniometers are reviewed and detailed descriptions given of 3 methods which have been used in the hf and vhf bands (3-100 Mc/s). The first, a field-coil interconnection method, requires no apparatus other than a signal generator and detector, has a limited application, but this disadvantage is offset by its simplicity. The 2nd method uses a resistance potentiometer capable of a high order of accuracy at frequencies up to 30 Mc/s. In the 3rd method two inductive piston attenuators are used. This apparatus is very accurate and may be used at the highest frequencies now employed for direction-finding purposes. The importance of the measurement of errors due to the electrical asymmetry of the field coils and search coil is emphasized, and methods used at hf and vhf are described. The accuracy and limitations of the methods are discussed and their merits compared. Details of the construction of the measuring apparatus and of its calibration are given, and typical error measurements made on various goniometers are included. ABSTRACT NO. 3: Errors in goniometers may be divided, for convenience of measurement, into two types: asymmetry errors, i.e., those errors which are due to asymmetry of the coils and whose magnitudes are dependent upon the nature of the external circuits; and instrumental errors, i.e., the remaining errors, the magnitudes of which are independent of the external circuits. The paper describes methods which have been used in the high- and very-high frequency bands (3-100 Mc/s) at the National Physical Laboratory for the measurement of both these types of error in inductive goniometers. Three methods of instrumental error measurement are described. They all involve the application of two signal-frequency voltages or currents of known ratio, one to each field coil of the goniometer, and the comparison of the reading of the goniometer for minimum search-coil output with the true angle, the tangent of which is equal to the voltage ratio. In the first method the ratio of the field-coil currents is determined by the manner in which the sections of the field coils are interconnected. This method is of limited application both as regards type of goniometer and completeness of the test, but it has the advantage of simplicity. Its usefulness is confined to the lower frequencies, as its accuracy falls to about 0.5 deg at 10 Mc/s. In the second method, a low-resistance potentiometer provides the two field-coil voltages. The tapping points on the screened resistance wire are so chosen that, when taken in pairs, voltage ratios corresponding to 14 different angles in each quadrant are obtained. It is calibrated on direct current and is accurate to within 0.25 deg at a frequency of 30 Mc/s. In the third method, two inductive-type piston attenuators control the field-coil voltages. Their injection coils are connected in parallel to the signal-generator output, and the voltage ratio is determined by the relative positions in the collector coils. The attenuation coefficient of each attenuator was calculated from the dimensions, and the change of the coefficient as the collector coil approached the ends of the cylinder was measured by using the two attenuators in conjunction. The changes were small, and corrections were necessary only when angles within 5 deg of the axial points were required. Using this method, measurements have been made with an accuracy of better than 0.1 deg at frequencies up to 150 Mc/s, and it is considered possible to maintain this accuracy up to 500 Mc/s or more if a frequency correction is applied to the attenuation coefficient. The measurement of the asymmetry error is, under certain conditions of use of the goniometer, as important as that of the instrumental error. The method used for this measurement consists in the application of a voltage between the field coils and the case of the goniometer, in addition to those across the field coils, and the observation of the consequent changes in the readings. The results are dependent, not only upon the degree of asymmetry and the voltage ratio, but also upon the condition of the external circuits. For the purpose of the measurements, one terminal of the search coil was connected to the case and the field-coil circuits were designed so as to simulate as far as possible the actual conditions under which the goniometer would normally operate. The test circuits differed slightly according to the frequency used. In the hf case a mean potential of 100 times the field-coil voltage could be applied to both field coils simultaneously, while in the vhf case the mean potential was limited to 30 times and could be applied to only one field coil at a time. Details of the construction of the measuring apparatus and specimens of error measurements made on various types of goniometers are given in the paper. (a_1-5, a_2-3, a_3-1, b-1, c-1, d-5, e-209, f-Goniometer errors. See Abstract No. 1648)

2950. PRESSEY, B. G., "Radiogoniometers for High- and Very-High-Frequency Direction Finding," JIEE, part III, vol. 95, pp. 210-220; July 1948. ABSTRACT NO. 1: Principles of design of inductive radiogoniometers for use in the 3-100 Mc/s band are discussed. Salient features are the coupling law, the electrical symmetry of the field coils and the coupling factor. The principal component of the instrumental error is the coupling error. One method of reducing it involves the use of a distributed search-coil winding, and the other the use of a compound-wound type of search coil. If the turns of the search-coil winding are wound on a cylindrical former so that they cover the surface completely, the coupling error is negligible, irrespective of the form of the field coils. Four hf instruments designed on this principal are described, and details of their performance are given. In the compound-wound search coil the winding is in two sections, the planes of which are set at an angle to each other. It is shown that the coupling error is dependent upon this angular separation and upon the configuration of the magnetic field. An investigation into the design of the field coils indicates how the most suitable field configurations may be obtained. The design and construction of a vhf goniometer embodying these principles is described, and its measured performance confirms the theory of operation. The importance of electrical symmetry of the field coils is stressed. Comparison between goniometers of the two types shows that, in general, for mf and hf the distributed search-coil winding is the more suitable, and for vhf operation that with the compound-wound search coil. ABSTRACT NO. 2: The paper is concerned with the design and performance of radiogoniometers of the inductive type for use in direction-finding systems operating in the frequency band 3-100 Mc/s. The function of a goniometer is to provide an efficient coupling between the aerial system and the receiver and to indicate the angle whose tangent is the ratio between the resultant currents flowing in the two aerial circuits in which the goniometer field-coils are connected. The main factors to be considered in the design of an instrument are the coupling law between the search coil and the field coils, the electrical symmetry of the field coils and the coupling coefficient. The principal component of the instrumental error is the coupling error, which is due to non-uniformity of the magnetic field produced by the field-coil currents. Two different methods have been used to reduce it to a satisfactory value. Both of them depend on the method of construction of the search coil, one involving the use of a distributed winding and the other the use of a compound winding. It can be shown that if the turns of the search-coil winding are wound on a cylindrical former so that they cover the surface completely, then the coupling error is negligible irrespective of the configuration of the magnetic field. Four hf instruments covering different frequency ranges have been designed using this principle. Another interesting feature in their

design is the use of separately screened field coils which are constructed like miniature D/F loops. In the compound-wound search coil the winding is in two sections, the planes of which are set at an angle to each other. The magnitude of the coupling error is dependent upon this angular separation and upon the configuration of the magnetic field. The error varies with angle of separation for a given field configuration. The optimum angle depends on the field configuration, and an investigation into the design of the field coils has shown how the most suitable configuration may be obtained. A goniometer embodying these principles has been designed for operation over the frequency range 30-100 Mc/s. Electrical asymmetry of the field coils with respect to the case of the goniometer (or earth) can give rise to appreciable errors particularly if the mean potential of the coils is very large compared to the voltage across them. The asymmetry may be due to capacitance coupling between the field coils and search coils asymmetry of the magnetic field or spatial distribution of the windings. Errors due to these causes have been reduced by the use of an electrostatic screen round the field coils, by accurate construction of the coils and by winding either the field coils or search coil so as to be equivalent to a coil of negligible axial length. The residual asymmetry errors were low, even when one terminal of the search coil was connected to the case. Complete measurements of the performance of these goniometers have been made. In the hf type the coupling coefficient is 0.5 and the total error does not exceed 1 deg; in the vhf type the corresponding figures are 0.33 and 0.7 deg respectively. If the goniometer is used as a phase-shifting device it can be shown that it has the same instrumental error as when used as an amplitude comparator in a direction-finder. (a_1-2, a_2-1, b-1, c-1, d-5, e-209, f-Goniometers)

2951. TAYLOR, I., "AN/CRD-6 Direction Finder Equipment," Federal Telecommunications Laboratories, Nutley, New Jersey, Progress Report No. 23 (amended); TIP No. R921; July 1948. ABSTRACT: The 2 engineering models of the CRD-6 equipment were assembled. The indicators were redesigned to permit simultaneous observation of the neon indication and the azimuth scale. In order to reduce noise, helical gears were substituted for the original spur gears in the antenna. The bakelite disk, which is fastened to the outer Marcolite drum of the antenna housing, was grooved to prevent slippage. (a-3, b-3, c-1, d-1, e-0, f-Description)

2952. BARFIELD, R. H., AND BURGESS, R. E., "Small Aerials in Dielectric Media," Wireless Eng., vol. 25, pp. 246-253; August 1948. ABSTRACT NO. 1: Experiments, with theoretical discussion, to investigate the effect of surrounding open antennas and loops with dielectric materials, in order to improve the sensitivity of direction-finding systems. Results indicate that dielectrics exhibit pickup effects analogous to those of conductors. A single formula is derived for the current in an ellipsoidal receiving antenna, which applies generally to conducting or dielectric materials. The sensitivity of Adcock-type direction finders could probably be increased by surrounding them with low-loss dielectrics; but as the dimensions of the dielectric must greatly exceed those of the antenna system, the increase could be achieved more easily by enlarging the antenna system to make full use of the space which would be occupied by the dielectric. ABSTRACT NO. 2: Study of effect of surrounding open antennas and loops with mass of dielectric material all dimensions being small compared with wavelength, with object of assessing improvement in sensitivity of compact direction finding systems; dielectric materials exhibit pick-up effects analogous to those of conductors, but in Adcock system enlarging antenna may prove simpler expedient. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Experimental study)

2953. HORNER, F., "Properties of Loop Aerials," Wireless Eng., vol. 25, pp. 254-259; August 1948. ABSTRACT NO. 1: Nonuniform current distribution in a loop occurs unless the wavelength of excitation is much greater than the perimeter of the loop. Such distribution results in a nonuniform field around the loop; this field may be represented as that from a uniform-current loop, which is a true magnetic dipole, plus a component from an electric dipole, suitably located relative to the loop and suitably excited. Similarly, the field from a compound loop comprising two coplanar, nonuniform loops excited in parallel can be considered as due to that from a uniform loop plus components from two electric dipoles. The appropriate location and excitation of such effective dipoles are discussed for circular and rectangular loops of simple and compound types. The radiation resistance of such loops differs greatly from the value calculated on the assumption of uniform loop-current distribution. ABSTRACT NO. 2: A simple loop, excited at HF, carries a current which is non-uniform in amplitude, unless the wavelength of excitation is very great compared with the loop perimeter. This non-uniform current distribution results in a correspondingly non-uniform field around any circle coaxial with the loop. The field of a loop with a perimeter $> \lambda/4$ can be represented as that due to a uniform-current loop (a true magnetic dipole) together with a component due to an electric dipole of suitable location and excitation. A loop formed by combining two non-uniform coplanar loops and exciting them in parallel so that the magnetic dipoles are additive is similarly equivalent to a uniform-current loop together with two dipoles suitably spaced and excited. The appropriate locations and excitations of the effective dipoles are discussed for circular and rectangular loops of the above simple and compound type. It is also shown that the radiation resistance of a loop carrying a non-uniform current is materially different from the value calculated by assuming a uniform current distribution. (a_1-5, a_2-/, b-1, c-1, d-5, e-0, f-Loop theory)

2954. MEDHURST, R. G., "Radiation from Short Aerials," Wireless Eng., vol. 25, pp. 260-266; August 1948. ABSTRACT: A new trigonometrical approximation is developed and a theorem, based on this approximation and introducing a new concept called "the current center of gravity" of an antenna, is used to show that radiation patterns from linear radiators of length $< \lambda/2$ may be combined when the radiators are spaced in any way and carry currents of arbitrary phase differences. Examples of the use of the method are given. (a-5, b-1, c-1, d-5, e-0, f-Analysis)

2955. CARBENAY, F., "Extension, to Radiogoniometers for Atmospherics, of the Definition of the Operation Threshold in Terms of a Pulse Flux," Compt. Rend. Acad. Sci. (Paris), vol. 227, pp. 337-339; 2 August 1948. ABSTRACT: Note on principles underlying measurement of mean signal level of atmospherics and extended to cover atmospheric goniometers. (a-3, b-1, c-3, d-3, e-0, f-Goniometers)

2956. BROWN, C. R., "Omnidirectional Circular Polarized DF Antennas," Federal Telecommunications Laboratories, Nutley, New Jersey, Quarterly Progress Report No. 1, May-August 1948, TIP No. U2033; September 1948. ABSTRACT: The purpose of the project is to develop an omnidirectional, circularly polarized antenna for the 18 to 160 mc or 50 to 160 mc band. This band is to be covered with not more than 5 antennas. Promising omnidirectional circularly polarized systems discussed are: the loop and dipole system, RCA tilted element loop (equivalent electric-magnetic dipole), loop and parasitic dipole, and broadside helix system. To facilitate measurements of field characteristics of circularly polarized antenna systems, a continuously rotatable dipole mounted in a parabolic reflector has been selected as a suitable system. (a-3, b-3, c-1, d-1, e-0, f-Antenna study; see also Abstracts Nos. 2980 and 3009)

2957. HORNER, F., "Spaced Loop Aerials," Wireless Eng., vol 25, pp. 281-285; September 1948. ABSTRACT: Two types of screened loop for use in a vhf coaxial system are compared; each loop is about 90 cm square. The "simple" loop has a screen gap in the center of one side and output terminals at the center of the opposite side. The "twin" loop has two screen gaps at the center points of opposite sides and output terminals at the center of an additional member parallel to, and mid-way between, the sides containing the screen gaps. The "twin" loop has three advantages: (a) it is easier to test for polarization error, (b) the geometrical tolerances in setting it up are less strict, and (c) it is mechanically more stable and can be designed with lower moment of inertia. These advantages are achieved with no apparent reduction in sensitivity or in directional accuracy. (a-3, b-1, c-1, d-5, e-565, f-Description)

2958. SEELY, S., "A Study of Directional Antenna Systems for Radio D/F Purposes," Syracuse University, Progress Report No. 1, Contract No. W28-099-ac-458; TIP No. R963; September 1948. ABSTRACT: Not available; see Abstract No. 2967. (a-4, b-3, c-1, d-1, e-0, f-Study report)

2959. STRONG, C. E., "Position-Finding by Radio: First Thoughts on the Classification of Systems," Elec. Communications, pp. 278-285; September 1948. ABSTRACT: A number of ideas are set forth for classifying radio systems so that their relationship to one another can readily be seen. The first divisions of radio systems are communication and location, the term "radiolocation" being used to include the whole field of direction and range determination, direction-finding and radar, and much else. Radiolocation can first be divided into two parts including on the one hand all time-sum methods giving "range," and on the other hand all time-difference methods giving "direction." There could also be subdivisions into radar and nonradar groups to differentiate between systems which do and do not actively cooperate in radio-location. While this classification divides systems by application or function, further breakdowns must be made for systems falling in the same categories. (a-3, b-2, c-1, d-5, e-0, f-Classification study)

2960. TAYLOR, T. T., "A Discussion of the Maximum Directivity of an Antenna," Proc. IRE, vol. 36, p. 1135; September 1948. ABSTRACT: It is shown that as the diameter of a sphere, corresponding to the aperture of a broadside array, is reduced below 50λ, the radiation Q, which is the ratio of the energy stored in the intense portion of the induction field to the radiated energy, increases at an exceptionally high rate. In consequence, critical tolerance and bandwidth as well as ohmic loss are important limitations in the design of superdirective antennas. The mathematatic basis is outlined and examples are given. (a-3, b-1, c-1, d-1, e-0, f-Theory)

2961. ANNIS, R. W., "An Analysis of Radio Direction-Finding Systems, Part I," University of Illinois, Department of Electrical Engineering, Radio Direction-Finding Research Library, Technical Report No. 7, Contract N6-ori-71, Task Order XV; 1 September 1948 ABSTRACT: A general method for the analysis of all existing radio direction finding systems is proposed. A primitive direction finding system sufficiently broad in scope to embrace all existing systems is postulated. It is stated that the first element in this primitive system is of fundamental importance in radio direction finding. Proceeding on this premise, the synthesis and analysis is given for circularly disposed antenna arrays having harmonic radiation patterns. Equations are developed for expressing the electrical output of any harmonic array as a function of one or more input signals on the same frequency. Terms are defined and sample curves are given which will theoretically resolve the direction of arrival of each of two interfering waves. (a-1, b-3, c-1, d-1, e-272, f-Analysis)

2962. SINCLAIR, G., "The Patterns of Simple Antennas Mounted on Cylinders of Elliptical Cross-Section," Ohio State University Research Laboratories, with cooperation of Air Materiel Command, Wright Field, Dayton, Ohio, Report No. 301-310, Contract No. W 33-038 ac16520 (17380); 1 September 1948. ABSTRACT: A method for calculating the effect of a circular cylinder on the patterns of simple loop and dipole antennas mounted on or near the cylinder, has recently been described by P. S. Carter. The method depends on the possibility of calculating the pattern of the antenna when receiving plane waves, from a knowledge of the diffraction of such a plane wave around the object when the antenna is absent. When the antenna can be assumed to be of such a nature that it causes negligible distortion of the diffracted field, then the pattern is obtained immediately from the calculation of the diffraction field. Carter considered only cylinders of circular cross-section, but it is not difficult to extend his analysis to cylinders of elliptical cross-section. The elliptical cylinder is of some practical interest, particularly in connection with the patterns of airborne antennas. The phenomena involved in the radiation of energy by aircraft antennas are so complicated that theoretical investigations are essential for a thorough understanding of the patterns. At the present time only the simplest geometrical shapes can be treated with any rigor, so for the analysis it is necessary to replace the complex structure of the aircraft with a suitably simplified structure. Carter has shown that the circular cylinder is a reasonable approximation to the shape of the fuselage of many aircraft. The elliptic cylinder is a better approximation to the shape of the fuselage of many airplanes, and it is also a very good approximation to the wings of an airplane. Since the diffraction of a plane wave around a cylinder of elliptic cross-section can be calculated, Carter's analysis can be extended to permit its application to more general situations. (a-1, b-3, c-1, d-1, e-751, f-Experimental theory)

2963. YARU, N., "Small High-Gain Arrays for Direction-Finding," University of Illinois, Radio Direction Finding Research Laboratories, Technical Report No. 6, Task Order 16; TIP No. U2617; 6 September 1948. ABSTRACT: The performances of small linear arrays, end-fire and broadside, are analyzed theoretically to determine whether or not "super-gain" arrays are of practical value. The mathematical techniques involved in the solution for directivity patterns, antenna currents, driving point impedances, theoretical efficiencies, and figures of merit for these arrays are outlined. The correspondence between the nulls of the array pattern and the roots of a complex polynomial on the unit circle in the complex plane is utilized to solve for antenna current amplitudes and phases, and to graphically plot the directive field pattern. In the analysis for endfire arrays, the roots of these polynomials are equally spaced on an appropriate length of arc in order to obtain an improvement in directivity. The properties of the Tchebyscheff polynomials are applied to the algebraic expressions for broadside arrays to solve for the resultant current distribution in "super-gain" broadside arrays. It becomes evident from the study that it is theoretically possible to obtain arbitrarily sharp directivity with an array of fixed length by using a sufficiently large number of elements. However, the necessary close spacing and phase relations between the elements causes the performance figures of the arrays to decrease to such values that the systems become very impractical. (a-1, b-3, c-1, d-1, e-0, f-Antenna theory)

2964. ANONYMOUS, "Instruction Book for Reradiation Frequency Meter Equipment, Navy Model OCQ," Herbach & Rademan, Incorporated, Philadelphia, Pennsylvania, NAVSHIPS 91134, Contract NXsr-55075; 13 September 1948. ABSTRACT: The Re-radiation Frequency Meter, Navy Model OCQ, is a test instrument designed as an aid in installation, maintenance and service of direction-finder equipments operating in the range from 2.0 to 20 megacycles. With the aid of this instrument, personnel responsible for the installation, maintenance and proper operation of the direction-finder, can determine the possible sources of error from resonant structures, such as masts or guy-wires, and estimate the relative magnitude of error which may be introduced in each case. The results of the tests will indicate the best possible location for the direction-finder position. With this done, the remaining sources of error may be eliminated or altered, so that their effects on the accuracy of bearing indication can be brought to negligible proportions. Re-radiators can very drastically affect the ability of a direction-finder to determine a true bearing indication. Near the direction-finder installation may be antennae, masts, guy-wires, etc., which may be sharply resonant within its operating frequency range. They will produce large errors at these resonant frequencies for the bearings obtained from the direction-finder. In use, the Re-radiation Frequency Meter determines the frequencies at which resonance occurs and also the relative "Q" of any radiator which might be resonant in the frequency range covered by the instrument. (a-1, b-3, c-1, d-1, e-643, f-Instruction manual; located in instruction book file section, D/F library)

2965. WALTERS, A. W., AND HUFFMAN, L. C., "Experimentally Determined Characteristics of Cylindrical Sleeve Antennas," USN, NRL Report No. R-3354; 13 September 1948. ABSTRACT: A series of measurements has been completed of the impedance characteristics of cylindrical sleeve antennas mounted upon and perpendicular to a ground plane. These measurements were conducted over a wide range of frequencies, radiator and sleeve diameters, and ratios of radiator length to sleeve length. The data thus obtained have been plotted in families of curves of resistance and reactance vs frequency, considering each of the physical variables separately. The data presented are of maximum utility in determining the physical dimensions from specific antenna impedance and frequency range specifications, or conversely, in determining the electrical characteristics of a given physical design. Specific examples are presented utilizing these data for the design of sleeve antennas for each case. A comparison of the impedance characteristics of a sleeve antenna and a base-fed cylindrical antenna of the same over-all length and diameter is presented. As a further demonstration of the usefulness of the data, scaling was performed on one of the model sleeve antennas resulting in a second sleeve antenna with practically identical impedance characteristics in another frequency range. (a-1, b-3, c-1, d-1, e-320, f-Experiment report)

2966. KESSLER, W. J., "Direction Finding and Ranging on Atmospherics," Florida University, Engineering and Industrial Experiment Station, Final Report; TIP No. U7054; 17 September 1948. ABSTRACT: The factors influencing the bearing fluctuations observed during the night with the standard AN/GRD-1A atmospherics direction finder are discussed. A modified crossed Adcock antenna system was developed which reduces the bearing fluctuations during the night to about a tenth of that observed with the conventional crossed-loop antenna. The nighttime bearing fluctuations in the VLF region are caused by polarization effects of the electromagnetic waves reflected from the ionosphere. An investigation on the possibility of determining the distance to atmospheric sources through analysis of their wave forms was based on the time differences observed between successive maxima of the wave forms observed during the day. No satisfactory correlation was obtained between the great-circle distances to atmospheric sources and the measured time intervals. The method employed to measure the effective height of the ionosphere at a frequency of 18.0kc. is described. It is shown that the probable contour of the ionosphere during the winter day ranges from 68 to 70 km. A theoretical study of the properties of spaced-loop antenna systems for use with the standard AN/GRD-1A direction finder is presented. Coaxial and the coplanar forms are considered. The coaxial form is not suitable for use with the AN/GRD-1A because of a complex directivity characteristic. Coplanar forms are useful with the AN/GRD-1A provided conventional sensing techniques are not attempted and the spacing between the loop elements can be increased sufficiently to provide adequate sensitivity. An experimental investigation of the proximity effects between the elements of a crossed-loop antenna structure is reported. The directional errors due to close spacing of the elements can be reduced to about 1° by increasing the spacing to 10 ft. or more. The theoretical basis for and a complete description of the alignment procedure developed for use with the standard AN/GRD-1A direction finder are presented. In an experimental study of the practicability of incorporating a sense determination circuit for use with the AN/GRD-1A, the system operated satisfactorily, but proper adjustment was too difficult to achieve for field application. The possibility of employing

the compensated-loop system for the reduction of bearing errors due to polarization effects is discussed. A theoretical and experimental investigation was made of the practicability of employing short-range site calibration techniques with the AN/GRD-1A installations. The technique investigated was not reliable; highly portable calibration equipment does not appear practical. A theoretical study is reported on the possibility of correcting bearing errors encountered with instantaneous direction finders due to imperfections in the construction of commercial cathode-ray tubes. Errors due to a nonperpendicular relationship of the deflecting plates of the cathode-ray tubes can be completely corrected. Correction is accomplished by rotating each loop element in the appropriate direction through an angle equal to half the angle by which the deflection axes of the cathode-ray tubes deviate from a perfect right angle. (a-3, b-3, c-1, d-1, e-0, f-Spherics. See Abstract No. 2901)

2967. LE PAGE, W. R., ET AL., "A Study of Directional Antenna Systems for Radio D/F Purposes," Syracuse University, Institute of Industrual Research, Report NO. 5; TIP No. U10968; ca 30 September 1948. ABSTRACT: Basic solutions are given for the field patterns of a circular array consisting of a continuous current sheet of discrete elements. Good agreement was obtained between experiments and a theory which predicts amplitude and phase information for the field pattern of a single element in front of a cylinder. The Wullenwever array was approximated by assuming a continuous current sheet, each integration element of which had a field pattern of the form predicted by that theory. This assumption also seemed justified for discrete elements spaced at less than one-half wave length. For greater spacings a summation of 1 term for each element was ured. The beam widths of experimental arrays were 15° to 40°. Phase distortion was worse in the circular array than in the Wullenwever type. Results of coupling the feed system capacitively to a 5-element Wullenwever array were encouraging. Theoretical horizontal-plane patterns obtained for an Adcock in which a pair of cophasally-fed elements replaced each element of the ordinary H-Adcock to give a broadside effect showed the expected reinforcement advantageous when the base of the Adcock was more than one-half wave length. Tests with an automatic pattern recording system showed that patterns obtained when transmitting and receiving were the same. Pertinent dimensions of the Wullenwever array for various frequencies are given in terms of wave lengths. (a-3, b-3, c-1, d-1, e-0, f-Wullenwever and Adcock antenna studies)

2968. JOUGUET, M., "Wave Propagation in Nearly Circular Waveguides and Arrangements for Transmitting H_0 Waves around Bends," Cables et Transm., vol. 2, pp. 257-284; October 1948. ABSTRACT: This is a full paper with an English Summary. (a-4, b-1, c-3, d-3, e-0, f-0)

2969. PIGGOTT, W. R., "A Method of Determining the Polar Diagrams of Long Wire and Horizontal Rhombic Aerials," Radio Research Special Report No. 16: (Book Notice); H.M. Stationery Office (London) Department of Scientific and Industrial Research, Radio Research; October 1948. ABSTRACT NO. 1: The elementary theory of an end-fed long-wire aerial is discussed and the factors influencing the polar diagram described. The effect of terminating the aerial is analysed and it is shown that the impedance at the feeder end of the aerial does not affect the shape of the polar diagram. A method of calculating the positions and amplitudes of the main lobes of the polar diagram rapidly and easily for a large number of frequencies is described and typical design charts presented. These methods are also applied to the determination of the polar diagrams of horizontal rhombic aerials. The final results may be presented as families of contour curves of constant directivity against angle of elevation and azimuth for a constant frequency, or as curves giving the position and relative amplitude of the main lobes in the vertical plane through the aerial against angle of elevation and frequency. The methods described may be easily applied to other types of long-wire aerial or to linear arrays of aerials having constant input amplitude in each aerial and constant relative phase shift between aerials. ABSTRACT NO. 2: Theory of end fed long wire antenna; effect of antenna termination is analyzed and it is shown that impedance at feeder and of antenna does not affect shape of polar diagram; method of calculating positions and amplitudes of main lobes of polar diagram rapidly; methods applied to determination of polar diagrams of horizontal rhombic antennas. ABSTRACT NO. 3: The field of a wave close to the earth's surface is considered in terms of the electrical properties of the ground. Expressions are derived for the induced emf in an element of an aerial, the current at the feeder end, and the effects of terminating impedances. The polar diagram of a long-wire aerial is obtained as a product of "ground," "projection" and "integral" functions. A method of obtaining polar diagrams is described. This can be used to examine changes in directivity with frequency. A series of charts is given and a routine described by which the labour of calculating the diagrams is much reduced. The method is also applied to horizontal rhombic aerials. (a_1-5, a_2-3, a_3-5, b-3, c-1, d-5, e-496, f-Antenna theory)

2970. BARKER, R. H., "Rhombic Aerial Design Chart," Wireless Engr., vol. 25, pp. 361-369; November 1948. ABSTRACT: A graphical method is given for solving the equation for the angle of elevation at which the gain of a horizontal rhombic aerial is a max., consideration being restricted to the vertical plane containing the major axis. The resulting chart has been used to prepare families of curves summarizing all the properties of the aerial as regards the major lobe. An extension has been made to include the effects of a ground plane of finite conductivity and permittivity. (a-2, b-1, c-1, d-5, e-0, f-Antenna design)

2971. BARZILAI, G., "Mutual Impedance of Parallel Aerials," Wireless Engr., vol. 25, pp. 343-352; November 1948. ABSTRACT: Formulae are given for the mutual impedance between two vertical aerials of different lengths, terminated at a perfectly conducting plane, and assuming sinusoidal current distribution. Using the formulae and a graphical method of integration, some calculations are carried out for aerials of different lengths. Some of the results obtained by the graphical method are compared with the corresponding values obtained by the formulae. The values so calculated are used to investigate the behaviour of a driven aerial, with a single parasitic element of the same, and of different lengths. (a-3, b-1, c-1, d-5, e-0, f-Experimental analysis)

2972. CRAMPTON, C., STRUSZYNSKI, W., DE WALDEN, S., AND REDGMENT, P. G., "Some Principles of Underlying the Design of Aerial Systems for High-Frequency Radio Direction-Finders in H.M. Ships," JIEE, Part III, vol. 95, pp. 437-453; November 1948. ABSTRACT NO. 1: The chief design problems arise from the existence of the secondary field from the mast on which the direction-finding antenna must be placed, and the necessity for long feeders (up to 150 feet) to the receiver. Fixed crossed-loop antennas of the single-turn, screened type are used, directly connected to twin screened feeders, which are coupled to the receiver by means of a transformer. The sense antenna consists of a vertical rod coaxial with the loops and mast, and a counterpoise system immediately below the loops. A test signal for the antenna system is provided from a small loop placed inside the direction-finding loops and at 45° to each. A high degree of equivalence of the direction-finding loops and symmetry of the whole structure is required; the magnitudes of the errors introduced by departures from the ideal conditions are investigated. The mechanisms of antenna effect (nondirectional response) and steps taken to reduce it are described. A detailed account of the principles and practice of sense determination is given. ABSTRACT NO. 2: Deals with the design of direction-finding aerial systems to cover the whole of the hf band, to work on the ground wave and to meet the naval conditions. The special problems encountered are intimately connected with the siting of the D/F aerial. The aerial must be fitted to the top of a mast, and often at a considerable distance from the receiving compartment. The most satisfactory design of D/F aerial consists of two fixed crossed loops with an incorporated sense aerial, and a network for injecting test signals into the D/F and sense-aerial circuits. The aerial system must be connected to the receiving apparatus by means of transmission lines which may be very long. The paper describes the special problems experienced in achieving satisfactory performance in sensitivity, bearing accuracy and resolution of sense ambiguity, the compromises in design that have to be adopted and the performance figures obtained. (a_1-2, a_2-3, b-1, c-1, d-5, e-65, f-Design principles)

2973. FRADIN, A. Z., AND KHATSKELEVICH, V. A., "An Investigation of Resonances and Asymmetry in the Adcock Aerial Systems," Radiotekhnika (Moscow), vol. 3, pp. 6-28; November and December 1948. ABSTRACT: A rigorous analysis is given of the resonance phenomena taking place in the H-type Adcock system, in order to determine the type and magnitude of errors introduced into the system by asymmetry in various elements. The usual practice of identifying the frequency characteristic of the system with that of its input impedance appears in general to be incorrect. (a-3, b-1, c-2, d-2, e-0, f-Analysis)

2974. JORDAN, E. C., AND MEYERS, J. J., "Radio Direction Finder System Analyser," University of Illinois, Electrical Engineering Research Laboratory; November 1948. ABSTRACT: A device to facilitate the testing of radio direction finding systems is described. It consists of a signal source and suitable phase-shifters for simulating the voltages which would appear at the antenna terminals of any direction finder collector array. It is shown that the Analyser may reduce considerably the time required for the analysis of direction finder

systems, and in particular, the analysis of new systems. Typical test results when the Analyser is applied to a Navy Model DAK direction finder are given. A new Doppler-type system is described. It is suggested that the Analyser would be valuable for training purposes. A method for precise phase measurement at radio frequencies is described. (a-1, b-3, c-1, d-1, e-0, f-RDF analyser. Paper read before the NEC, 4-6 November 1948)

2975. KOHLER, H., "Vertical-Aerial Radiation Characteristics over Uneven Terrain," Elektrotechnik, vol. 2, pp. 297-304; November 1948. ABSTRACT: A detailed theory is given of the directional characteristics of arrays of vertical antennas over uneven ground. A D/F system described by Stenzel, while giving good results for eliminating the effects of variation of earth constants in the case of level ground, does not give such good results over uneven ground. Measurements of directional characteristics which support the theory are described and the physical connection between measured reflection factors and the electrical properties of the ground is considered. (a-3, b-1, c-4, d-4, e-0, f-Theory)

2976. LEDBETTER, J. B., "Basic Problems in Sampling Loop Design," Radio-Electronic Engng., (Issued with Radio Televis. News), vol. 11, pp. 16-18, 30-31; November 1948. ABSTRACT: Such loops are used to monitor the phases of the individual elements of an aerial array. The essential requirements are: (1) symmetry of loop and transmission line; (2) identical phase shift in each loop and line; (3) constancy of pick-up voltage; (4) equality of loop size; (5) mechanical rigidity and insensitivity to weather conditions; and (6) absence of phase shift through loop tuning, if used. (1) is achieved by making the loops identical in size and the lines in length and (2) by identical location of each loop with respect to its tower. Choice of location will depend upon aerial height and proximity to a current antinode is desirable, but other factors such as hv insulation, base currents, weatherproofing and accessibility must be considered. Sometimes a separate mast for the loop is found justifiable. Some designs of the untuned loop, which is the preferred type are described. (a-2, b-2, c-1, d-1, e-0, f-Description)

2977. SINCLAIR, G., "Theory of Models of Electromagnetic Systems," Proc. IRE, vol. 36, no. 11, pp. 1364-1370; November 1948. ABSTRACT: Most model measurements are made on models which simulate only the geometrical configurations of the lines of force in the fields of the full-scale system, and thus yield only relative results for many of the properties of the system. It is possible, however, to devise models in which the measurements are on a quantitative or absolute basis in terms of the full-scale system. The conditions to be satisfied in an absolute model for accurate simulation are derived. The limitations imposed on practical models are discussed. (a-1, b-1, c-1, d-1, e-0, f-Theory)

2978. ANONYMOUS, "Proceedings of the National Electronics Conference," Chicago, Illinois; 4-6 November 1948. ABSTRACT: See Abstract No. 2974 for applicable reference. (a-4, b-1, c-1, d-1, e-0, f-Papers)

2979. ECKART, G., AND KAHAN, T., "On the Choice of Integration Paths in the Problem Relating to the Radiation of a Dipole above a Plane Earth," Compt. Rend. Acad. Sci. (Paris), vol. 227, pp. 969-970; 8 November 1948. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-Evaluation)

2980. BROWN, C. R., "Omnidirectional Circularly Polarized DF Antennas," Federal Telecommunications Laboratories, Quarterly Progress Report No. 2, September - December 1948, TIP No. U4881; December 1948. ABSTRACT: A study to determine the characteristics of helical antennas as omnidirectional circularly polarized radiators indicated the impedance characteristics of very small helixes to be very poor and the investigation has been abandoned. Uniformly omnidirectional patterns were not obtained from simple (1-conductor) helixes having diameters about $\lambda/4$. Good pattern characteristics were obtained from a 4-conductor multifilar helix from 800 to 1400 mc. This system is about $\lambda/4$ in diameter at 1000 mc. and has a relatively small ground plane. The conductors are about $\lambda/4$ in length at 1000 mc. The impedance of this system appears satisfactory. (a-3, b-3, c-1, d-1, e-0, f-Study. See also Abstracts Nos. 2956 and 3009)

2981. CLEAVER, R. F., "Development of Single-Receiver Automatic Adcock Direction-Finders for Use in the Frequency Band 100-150 Megacycles per Second," Elec. Commun., vol. 25, pp. 337-362; December 1948. ABSTRACT: The paper describes the development of automatic direction-finders primarily intended for measuring the bearings of aircraft, on signals radiated in the frequency band 100 to 150 megacycles per second. The basic system employs fixed elevated-H Adcock antennas and a single receiver, and, with the exception of the earliest model, all instruments give cathode-ray-oscillograph indication. An examination of the advantages and limitation of fixed-antenna automatic direction-finders employing two or more receivers leads to an account of the reasons for the adoption of a single-receiver system in the present development. The principles and evolution of this system are explained with reference to the original experimental models, whose performance is discussed. A naval direction-finder based on one of the experimental models is described in detail, and statistics are presented to show that the probable instrumental error varies from about 0.6 to 1.25 degrees over the frequency band, after compensation for octantal error. Bearings can be measured on signals of field strength down to 7 microvolts per metre or less. The paper concludes with a description of direction-finders for use on land. One of these, under current development, will be capable of unattended operation on two alternative frequency-channels, with bearing indication and full remote-control at points up to 20 miles distant. (a-1, b-1, c-1, d-1, e-0, f-Description)

2982. CLEAVER, R. F., "Note on a Short-Range Radio Position-Finding System Using Modulated Continuous Waves," Standard Tele. & Cables, Ltd., Elec. Communication, pp. 363-372; December 1948. ABSTRACT: The paper describes a position-finding system by which the polar coordinates of any suitably equipped aircraft can be determined at a single base station using phase-comparison range-finding apparatus and a VHF automatic direction-finder in conjunction with conventional communication equipment. An experimental model is described in which azimuth and range are displayed on a single cathode-ray oscillograph, which may be installed in an airport control tower. Range is indicated without ambiguity up to 100 nautical miles, and there is no azimuthal ambiguity. So far, the model has been used primarily to demonstrate the principles of the system, in conjunction with an aircraft fitted with experimentally modified British Air Ministry VHF communication equipment. (a-3, b-2, c-1, d-5, e-0, f-Description)

2983. HALLEN, E., "Properties of a Long Antenna," Jour. Appl. Phys., vol. 19, pp. 1140-1147; December 1948. ABSTRACT NO. 1: Well-known integral expressions for the outgoing current waves are transformed into series expansions valid for all distances from the feeding point; results thus obtained are shown graphically. ABSTRACT NO. 2: Although exact integral expressions for the outgoing current waves on a long aerial have long existed, they have never been brought into such a form that a numerical or graphical description of the wave has been possible. The author shows how to transform them into good series expansions valid for all distances from the feeding point. Graphs show the result. The travelling-current waves can also be extracted from the author's expression for the current on a finite transmitting aerial (Nova Acta Upsal, 11, 10, (1938). Both methods give identical series. (a_1-5, a_2-5, b-1, c-1, d-1, e-931, f-Theory)

2984. HOPKINS, H. G., AND HORNER, F., "Direction-Finding Site Errors at Very High Frequencies," JIEE, Paper 773, p. 12; December 1948. ABSTRACT: Summarizes theoretical and practical investigations of the cause and properties of site errors at metre wavelengths. Attention is mainly directed to Adcock-type aerial systems. A criterion is suggested for expressing the susceptibility of a direction-finder to site error, and is applied to well-known instrumental types. With some simplifying assumptions, the variations in error with azimuth and elevation angle due to "point," "linear," and "sheet" type reflecting obstacles are examined. Certain properties of error charts which may be useful in locating the sources of error on a site are discussed. Errors introduced by randomly dispersed obstacles are considered from a statistical viewpoint. Difficulties encountered in calibrating a site are discussed, the limitations of correction processes involving the use of previously measured error data being pointed out. Practical techniques for locating the effective reflecting obstacles on a site are described, and examples of their application are given. Methods for suppressing unwanted reflections are considered. (a-2, b-1, c-1, d-5, e-0, f-RDF errors)

2985. SAMBUY, E. B. B., "Diagram for Determining the Propagation Constant (for a Cable)," Alta Frequenza, vol. 17, pp. 274-279; December 1948. ABSTRACT: Not available. (a-4, b-1, c-9, d-9, e-0, f-0)

2986. STARNECKI, P., AND FITCH, E., "Mutual Impedance of Two Centre-Driven Parallel Aerials," Wireless Eng., vol. 25, pp. 385-

389; December 1948. ABSTRACT: A formula and curves are given for symmetrically placed antennas with a sinusoidal current distribution. Measurements at frequencies from 3 to 30 Mc, using vertical antennas above a horizontal earth mat 400 feet in diameter, are in fair agreement with theory) (a-3, b-1, c-1, d-5, e-0, f-Experiment)

1949

2987. BREMMER, H., Terrestrial Radio Waves, Elsevier Publishing Company, Inc.: New York; 1949. ABSTRACT: As radio technique developed the question arose of what range may theoretically be expected for waves sent out by a transmitter of a given strength and in a given position. Speaking mathematically-physically, this means that the electromagnetic field, and, more especially, the magnitude of the electric field, should be determined when the transmitter is given source of electromagnetic waves. Whereas this problem is comparatively simple for a transmitter in empty space, it becomes very difficult when we take into account the disturbance caused by the spherical earth. As a result of this influence we are faced with a problem of diffraction, which may be compared with that of the exact determination of the distribution of light in a space where the light coming from a given source is intercepted by screens or similar obstacles. Whereas this particular kind of problems may be solved in certain cases - as that of a screen formed by a half-plane - with the aid of integrals, the same does not apply to our diffraction problem. As in many other practical problems, the matter under consideration has to be greatly idealized. This is necessary in order not to make the calculations too involved; of course, any simplifications introduced should not exercise too great an influence quantitatively. In our case these simplifications comprise the following points: (1) The transmitter (that is, the transmitting antenna) is imagined to be of infinitely small dimensions. In practice, this means that the length of the aerial should be small in comparison to the wavelength. It should be borne in mind, however, that the field of a transmitter of finite length (in which the current is not necessarily the same at all points) may be obtained by integration from a superposition of infinitely small transmitters. (2) The earth is imagined to be spherical and homogeneous. With respect to its electrical properties the earth is then completely characterized by the dielectric constant, ϵ, and the conductivity, σ; the earth, therefore, is at the same time a dielectric and a conductor. (3) Suppositions regarding the constitution of the atmosphere. The simplest way is to assume the atmosphere to consist of empty space, i.e., non-conductive and with a dielectric constant equal to 1. This amounts in the first place to neglecting the influence of the ionosphere (the conductive layers in the upper atmosphere), and also that of the refraction in the lower atmosphere, which is chiefly caused by the differences in the vapour content at different heights above the ground. It is especially the ionosphere which renders possible the propagation of the waves over long distances; this is, however, of less importance for shorter distances, especially during day-time, because then the lower layers of the ionosphere (the so-called D- and E-layers) are strongly developed and absorb the radio waves instead of acting favourably for their propagation. In the present work we shall discuss the influences of the ionosphere and the refraction in the lower part of the atmosphere. In Chapters II - VI, inclusive, these influences will be entirely ignored, so that the atmosphere is there imagined to consist of empty space. The results obtained in this way apply, in accordance with what we said above, especially to day-time; they equally apply to night-time for those distances at which the field caused by the ionosphere (the so-called sky-wave) is small as compared to the direct field (the 'ground-wave'). The mathematical formulation of our problem will then be as follows. Of Maxwell's equations a solution is required satisfying the following conditions: (1) Outside the earth the equations for free space are valid; inside the earth the equations corresponding to the values of ϵ and σ assumed to exist there. (2) The field is singular at the transmitter (point source) which prescribes the character of this singularity. (3) On the earth's surface the field satisfies the usual conditions at an interface of two media, i.e., the tangential components of the electric and magnetic fields are continuous there. It is interesting to note that out radio problem is mathematically equivalant to a number of problems in totally different fields, for example, optics, acoustics, and the theory of elasticity. (a-1, b-6, c-1, d-1, e-0, f-Book)

2988. GILL, E. W. B., "A Simple Method of Measuring Earth-Constants," JIEE, vol. 96, Part IIIA, p. 141; 1949. ABSTRACT: In a wireless wave, moving over the surface of the earth, the electric force existing because the earth is not a perfect conductor is not vertical but is tilted forward slightly. It has therefore vertical and horizontal components which, in addition, happen to be out of phase. The ratio of these components and also the phase angle depend on the conductivity and dielectric constant in a theoretically calculable manner. An experimental determination of this ratio and phase angle leads, therefore, to a value of these earth constants. A method is described of making these determinations, using nothing more than an ordinary receiving set and the human ear. An incoming signal is received in succession on two short equal aerials inclined to the ground, one in the direction of the transmitting station and the other at right angles to this direction. The signal strength using either depends on the height of its free end. With the first aerial fixed, the height of the free end of the other can be adjusted until the signals are of equal strength. The first aerial is affected by both components, and the second only by the vertical components so that the equality of signals gives an equation involving the ratio of the components and the phase angle. Another experiment with a different fixing of the first aerial gives a second relation, and the two equations suffice to give both the ratio and the phase angle. (a-1, b-1, c-1, d-5, e-867, f-Description)

2989. SUNDE, E. D., Earth Conduction Effects in Transmission Systems, D. Van Nostrand Company, Inc., New York; 1949. ABSTRACT: The book is primarily concerned with methods of analysis of earth conduction effects and basic principles underlying protective measures against resultant circuit disturbances. The nine chapter headings are: Basic electromagnetic concepts and equations, earth resistivity testing and analysis, resistance of grounding arrangements, mutual impedance of insulated earth-return conductors, propagation characteristics of earth-return conductors, D-C earth conduction and corrosion protection, power system earth conduction and inductive interference, surge characteristics of earth-return conductors, lightning protection of cable and transmission lines. (a-3, b-6, c-1, d-1, e-0, f-373 Page book)

2990. BHATTACHARYYA, A. N., "Instrumental Landing System for Aircraft," Indian Jour. Phys., vol. 23, pp. 13-18; January 1949. ABSTRACT: General discussion of a system using the interference of ultra-high frequency waves radiated from two antennas excited in the same phase with a common frequency. (a-5, b-1, c-1, d-8, e-0, f-Description)

2991. GIROUD, P., AND COUILLARD, L., "Decca System of Hyperbolic Navigation," Onde Elect., vol. 29, no. 262, pp. 5-20; January 1949. ABSTRACT: A navigational system based on phase comparison of two waves emitted by two synchronized transmitters; use in both air and maritime navigation; development, applications, and operation of system; description of transmitters and receivers; photographs, diagrams. (a-3, b-2, c-3, d-3, e-0, f-Description)

2992. MILLINGTON, G., "Ground Wave Propagation over an Inhomogeneous Smooth Earth," Proc. IEE Part III, vol. 96, pp. 53-64; January 1949. ABSTRACT: The problem of the propagation is discussed in terms of the known solution for a homogeneous earth. The inhomogeneity refers only to changes in the earth constants from place to place, and the problem is idealized by assuming a wave radiated from a vertical idealized by assuming a wave radiated from a vertical dipole over a series of homogeneous annular sections. The solution is first given for the short-wave limit, where it is complete except in the neighbourhood of a boundary. By an approximate consideration of the energy flow at different heights above the ground, the solution is extended to the case of intermediate wavelengths where the first and last boundaries are in the diffraction region of the transmitting and receiving points respectively. It is then shown that a well-known empirical method yields the same solution when it is made reciprocal by taking the geometric mean of the value it gives and the value that would be obtained with the transmitter and receiver interchanged. This method is formally used to obtain a tentative solution for the effect of the disturbance function in the neighbourhood of a boundary. This suggests that on passing from a section of one value of conductivity to another of a higher one, there is a recovery in field-strength before the a tenuation of the wave becomes characteristic of the new section. On crossing the boundary in the other direction, there is a correspondingly increased drop in field strength before the attenuation takes its new characteristic type. Owing to the lack of sufficiently controlled conditions, most of the existing experimental results are inconclusive with regard to these features at a boundary, but some evidence is given in support of them. The paper deals briefly with the practical application of the method, and gives a specimen field-strength/distance curve for a route consisting of several land and sea sections. (a-1, b-1, c-1, d-5, e-0, f-Theory)

2993. ANONYMOUS, "Study of Beverage Wave Antenna for Use with Low-Frequency Loran," Radio Corporation of America, RCA Laboratories Division, Contract W-28-099-ac-315, Final Engineering Report; 1 January 1949. ABSTRACT: The Beverage wave antenna, for efficient operation, depends upon relatively low electrical conductivity of the ground over which the antenna is constructed. The ground conductivity near Hamlin, Saskatchewan, where the first research was done,

is unusually high, and consequently, the performance of the wave antennas at that location was quite poor. For this reason, the radiation efficiency of the wave antenna at Hamlin, as described in detail in Interim Reports 1 and 2, is not typical of this type of antenna. At Hamlin, the forward radiation from a one-mile wave antenna at a frequency of 180-kc was 28.3 decibels less than from the balloon antenna, or a power ratio of 676 to 1. Forward radiation from a two-mile wave antenna was 22.8 decibels less than from the balloon, or a power ratio of 190 to 1. Maximum radiation from two similar wave antennas at right angles was very nearly 4 decibels less than the maximum radiation from a single unit. During the research at Hamlin, a method of measuring the conductivity of the earth from impedance measurements made on a horizontal wire suspended above the earth was developed. The gain to be expected from an array of four one-wavelength antennas over ground of various conductivities, compared to a 625-foot top-loaded tower, at 100 and 180 kc was calculated. Experimental determination of the electrical point of origin of pulses from the wave antenna was inconclusive, due to lack of received signal at the slave station, and to other variables. No evidence was found that timing on the wave antenna would be any more difficult than on the balloon. In this final report, the theoretical investigation has been expanded to apply the input-impedance method to all types of soil and at higher frequencies. Families of curves of the various functions entering into the calculations have been plotted, as well as the theoretical attenuation and velocity constant curves for a wide range of conductivity and dielectric-constant values, from 50 to 500 kc. Measurements made at Goose Bay, Labrador included current-distribution at 117 kc, input-impedance from 50 to 400 kc on an antenna similar to the ones constructed at Hamlin, and input-impedance over the same frequency range on a 2-wire receiving antenna. The effective height of both antennas was measured by comparing the received signal strength on a vertical antenna of known effective height with the voltage induced in the wave antennas. From the input-impedance data, the attenuation and velocity-constant curves were derived over the frequency range of the measurements. The gain of the antennas was then calculated in Item 2, at 100 kc, 180 kc, and the frequencies at which effective-height measurements had been made. The calculated improvement in operation of the same antenna at 180 kc, by moving from Hamlin to Goose Bay, was 13.5 db which is about 3.5 db more than the comparison of effective height measurements at both locations. The theoretical investigation and the measurements at Goose Bay, as contained in this final report, confirm the general conclusions of Interim Report No. 2. Under the most favorable conditions of ground conductivity, an array of four wave antennas would require roughly 10 times the power of a 50%-efficient vertical radiator. Such favorable conditions may not be found in practice, resulting in less efficient operation and a power requirement 30 to 300 times that for a 50%-efficient vertical radiator. However, there may be military applications where other advantages of the wave antenna will be more important than its electrical efficiency. (a-1, b-3, c-1, d-1, e-605, f-Study)

2994. MILLINGTON, G., "Ground-Wave Propagation across a Land/Sea Boundary," Nature, vol. 163, p. 28; 22 January 1949. ABSTRACT: Theoretical consideration of the problem predicts that under certain conditions, at short, medium and long wavelengths, there should be a marked recovery in field-strength in crossing the boundary from land to sea. Measurements made at 3.9 m wavelength over a distance of 5 km, across a sea estuary (involving two land-sea boundaries) are in excellent agreement with the theoretical predictions. (a-3, b-2, c-1, d-5, e-0, f-Theory)

2995. ANONYMOUS, "Light Plane ADF," Aero Digest, vol. 58, no. 2, p. 32; February 1949. ABSTRACT: Automatic direction finder for personal plane developed by Directional Instruments Corp. of New York; System is completely electronic; size, weight, and price is far below that of conventional ADF on larger aircraft. (a-3, b-1, c-1, d-1, e-0, f-Description)

2996. BARZILAI, G., "Mutual Impedance of Parallel Aerials," Wireless Eng., vol. 26, p. 73; February 1949. ABSTRACT: Notation carrying correction of error in original article. See Abstract No. 2971. (a-4, b-1, c-1, d-5, e-0, f-0)

2997. DUNCAN, D. F., "Theory of Error Distribution: Application to Radio Navigational Aids," Wireless Eng., vol. 26, pp. 49-52; February 1949. ABSTRACT: The usual methods of calculating probable errors are described and applied to position-finding by radio methods where the position of the observer depends on "position-lines" from two transmitters. Assuming the Gaussian normal error law it is shown that if a large number of observations are taken, 1/n of them lie outside an ellipse given by $Ax^2 + 2Hxy + By^2 = \log_e n$ where A, H, and B are constants and x and y are position co-ordinates. The 50% ellipse (n = 2) gives a measure of fix accuracy, and is such that of a large number of observations 50% will lie within and 50% outside the ellipse. In this way curves of constant fix accuracy are obtained. Correlation with experiment is good. (a-3, b-1, c-1, d-5, e-0, f-Theory)

2998. LOEB, J., JEZO, M., AND LOMBARD, C., "A Voltage Discriminator; Its Application to Direction Discrimination," Ann. Telecommun., vol. 4, pp. 57-63; February 1949. ABSTRACT NO. 1: A description of the principles, construction and performance of a vhf D/F device which has an angular sensitivity of 10^{-4} radian. The apparatus is basically a goniometer which compares two low-level hf voltages and gives a signal which actuates a motor in a direction determined by the sense of the input voltage. Signal-voltage difference sensitivity is of the order of 1μv. ABSTRACT NO. 2: The equipment studied consists of a balanced aerial system, similar to an Adcock direction-finding system. Opposing voltages taken from the connecting line balance completely when the direction of the incoming signal is normal to the plane of the aerials, but will provide a voltage difference sufficient, and of the correct sense, to drive a motor, in one or the other direction, for an angular shift of 10^{-4} radian. The equipment is expected to operate over an angle of 10^{-2} radian and work was carried out mainly at a wavelength of 1m. A theoretical analysis and a series of laboratory and field tests are described. Test equipments range from: (a) a pair of dipoles with connecting line from which connections are taken to 2 rectifiers feeding a centre-zero galvanometer; to (b) a similar aerial system feeding a double-diode rectifier, the output of which is mixed with the output from a local oscillator, amplified at i.f. and a.f. and finally compared with the original received signal on a crt. The orientation of the trace is an indication of the direction of the incoming signal. Curves show threshold of sensitivity in radians against input voltage, time, local-oscillator frequency and mains voltage. (a_1-5, a_2-1, b-1, c-3, d-3, e-0, f-Measurements)

2999. LOMBARDY, P., "Errors in Radionavigation," Alta Frequenza, vol. 18, no. 1, pp. 24-28; February 1949. ABSTRACT: Errors and radionavigation; as application of classic probability theory to calculation of errors, "probable ellipse" or "50% ellipse," in case of fixing of position point with methods of radio navigational aids, is determined; distribution of error probability examined. (a-3, b-2, c-9, d-9, e-0, f-Analysis)

3000. PORTIER, H., "Consol Type Radio Beacons," Onde Electrique, vol. 29, no. 263, p. 57-65; February 1949. ABSTRACT: Principles underlying design; influence of spacing of antennas, of intensity in outside antenna, and phasing; particulars of Consol beacon installation at Bush Mill, Ireland; reference to new projects; diagrams. (a-3, b-1, c-3, d-3, e-0, f-Consol)

3001. SMITH, P. H., "R. F. Transmission Line Nomographs," Electronics, vol. 22, pp. 112-117; February 1949. ABSTRACT: Ten abacs for calculating characteristic impedance, high-frequency resistance, current-phase relationship, voltage gradient, SWR, etc. (a-3, b-2, c-1, d-1, e-0, f-Transmission lines)

3002. STEINHOFF, J. R., "Automatic Direction-Finder," Electronics, vol. 22, pp. 97-99; February 1949. ABSTRACT NO. 1: A light-weight and compact instrument having bearing accuracy within 1°. The externally mounted loop assembly is stationary and hermetically sealed; it consists of 4 coils arranged as two pairs at right angles. A special switching system enables each coil voltage to be sampled in succession 50 times a second and transmitted to the corresponding coil of the indicating meter, which is calibrated in degrees. Block and circuit diagrams are included. ABSTRACT NO. 2: The aerial system of this aeronautical instrument consists of 2 pairs of fixed coils set at 90° in goniometer fashion. When combined with the sense aerial their polar diagrams are 4 cardioids set at right-angles. The 4 coil voltages are sampled sampled separately and in sequence for 0.005 sec at 50 times/sec by means of a 4-ph oscillator, consisting of a ring-system of 4 blocking oscillators, which renders conducting in turn 4 Ge crystals in the aerial system. Combined with the sense-aerial signal these sampled voltages pass through a 0.2-1.7 Mc/s 3-band superheterodyne receiver and a thyratron switching system to the indicator, a 4-terminal differential-potential instrument of the ratiometer type. A field strength of 5μV/m gives 1° accuracy. (a_1-3, a_2-1, b-2, c-1, d-1, e-0, f-Description)

3003. YUNG-CHING YEH, "The Received Power of a Receiving Antenna and the Criteria for Its Design," Proc. IRE, vol. 37, pp. 155-158; February 1949. ABSTRACT: A general formula for the received power is derived. Two theorems which can be used as design criteria are deduced. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3004. ZEEK, R. W., "Investigation and Analysis of 'Capture Effect' in f-m and a-m Communication Systems," NRL Report 3422; February, 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

3005. WALTERS, A.W., AND HUFFMAN, L. C., "Vertical Patterns of Cylindrical Sleeve Antennas," NRL Report 3411, 2 February 1949. ABSTRACT: A series of measurements of the vertical patterns of specific sleeve antennas has been completed. The purpose of this investigation has been to determine the location of nulls in the vertical patterns and to correlate this information with that on impedance measurements, thereby producing complete information for the design of specific sleeve antennas. In general, this analysis has shown that optimum sleeve antennas are superior both in pattern and in impedance characteristics to simple antennas when considered for broad-band antenna usage; e.g., a normal vertical antenna fed against ground. Vertical patterns of the sleeve antennas are similar to those of simple vertical antennas at physical lengths below .25λ, but at longer lengths considerable differences are noted in the depth of the nulls as compared with the maximum field. (a-1, b-3, c-1, d-1, e-321, f-Experiment evaluation)

3006. MILLINGTON, G., "Deviation at Vertical Incidence in the Ionosphere," Letter in Nature, Lond., vol. 163, no. 213; 5 February 1949. ABSTRACT: Attention is called to the fact, first pointed out by Booker, that in vertical incidence sounding of the ionosphere, the two magneto-ionic components are bent away from the vertical and may ultimately be reflected from points as much as 50 km apart. Caution must therefore be exercised in interpreting the critical frequency separation between these components, particularly under conditions of marked horizontal ionization gradient. (a-3, b-2, c-1, d-5, e-0, f-Theory)

3007. ANONYMOUS, "V.H.F. Automatic Direction Finder," Engineer, vol. 187, no. 4856, p. 197; 18 February 1949. ABSTRACT NO. 1: A short account of the remotely operated installation at Brussels airport. Probable error should be 1 degree or less, with a range of 100 nautical miles to aircraft at 10,000 feet. The development of such equipment was fully discussed by Cleaver. ABSTRACT NO. 2: System installed at Melsbroek airport of Brussels, under supervision of manufacturers, Standard Telephones and Cables, London: equipment known as type "PV1B" is unattended and housed in small building; it is normally operated by remote control from desk. (a_1-3, a_2-3, b-1, c-1, d-5, e-0, f-Description)

3008. BOUIX, M., "Slotted Waveguides and Their Application as Aerials," Ann. Telecommun., vol. 4, pp. 75-86; March, 1949. ABSTRACT: A transmission line with "small loads" distributed along it is first discussed. These loads are in the form of quadripoles whose shunt admittance and series impedance are small compared with the characteristic impedance of the line. Representation of such loaded lines by means of circle diagrams leads to the concept of an equilibrium cycle. A study is made of resonant slots in the wall of a waveguide, these slots constituting the "small loads." The disposition of of slots for a desired radiation distribution is considered, in particular that giving (a) uniform distribution and (b) a 1:4:1 "gable" distribution. The relation between squint angle and the spacing of the slots is determined for different waveguides of American standard dimensions. A method of designing slot systems is outlined and the case is considered of a system of slots with $\lambda_g/2$ spacing, the waveguide being terminated by a short-circuting plunger at a distance of $\lambda_g/4$ from the end slot. Applications of slotted antennas are briefly reviewed. (a-3, b-1, c-3, d-3, e-0, f-Study)

3009. BROWN, C. R., "Omnidirectional Circular Polarized DF Antennas," Federal Telecommunication Labs., Inc., Quarterly Progress Report No. 3, December 1948-February 1949; TIP No. U5119, March 1949. ABSTRACT: The properties of 2 of the 4-conductor multifilar helical antennas when operating as a directional pair were investigated. To combine the signal picked up by these antennas with a 180° phase differential, a type II balun was constructed. This balun had the advantage that variation of frequency did not distort the balance of the output; however, its impedance properties were poor. The first measurements on model no. 1 were made on a system of helixes mounted directly on a ground plane large enough to serve for the entire system. The azimuth pattern showed the vertical component to be reasonably omnidirectional; the horizontal patterns were neither omnidirectional nor symmetrical. An attempt was made to eliminate the ground plane by supporting the helixes just above the end of the balun. This necessitated elimination of the shielding over the feed cables. Under these conditions the pickup by the feed cable made it impossible to discern the action of the directional pair. The helixes were then installed in the directional pair, model no. 2 consisting of a Lucite helix support which is in turn supported on an 18-in. metallic mast above the balun. The patterns illustrated reasonably good operation but there was some distortion caused by the pickup of radiation by the feed system. The distortion could probably be eliminated by maintaining the feed cable to the individual helixes at the same spacing as the antennas throughout their vertical span and shielding the horizontal space to the balun so that it could not pick up radiation. (a-3, b-3, c-1, d-1, e-0, f-See also Abstracts Nos. 2956, 2980, and 3028)

3010. BROWN, J. S., AND MOFFATT, V. J., "Directional Antenna for the 152-162-Mc Communications Band," Communications, vol. 29, pp. 14-16, 35; March 1949. ABSTRACT NO. 1: A corner-reflector type with vertical polarization, in which two sets of parallel rods, spaced 0.1λ apart in two vertical planes, are used instead of metal sheets. It has a unidirectional radiation pattern, a gain of at least 6 db over a λ/2 dipole and a voltage SWR < 1.5 over the whole frequency band. The feeder cable can have any impedance between 50 and 75Ω. ABSTRACT NO. 2: Describes the performance and construction of a corner reflector type directional aerial based on the use of plane conducting sheets of infinite size. The two reflecting sheets are simulated by using a number of 5/8λ vertical rods spaced ~ 0.1λ apart in a horizontal plane, a λ/2 dipole radiator being at a certain distance from the apex of the reflectors. Polar diagrams are given showing the effect of altering the apex angle of the reflectors and also the distance of the dipole from their apex. In the final design the polar diagrams only vary very slightly between 152 and 162 Mc/s. The average gain over a λ/2 dipole is 9 db in the frequency range and front-to-back radiation ratio varied between 23 and 31 db. The aerial can be used with 50-75Ω air or solid dielectric cable. (a_1-5, a_2-3, b-1, c-1, d-1, e-0, f-Description)

3011. EARP, C. W., AND GODFREY, R. M., "Radio Direction Finding by Cyclical Differential Measurement of Phase," Elect. Commun., vol. 26, pp. 52-75; March 1949. ABSTRACT: New type of direction finding and beacon system in which reduction of usual site errors is achieved by antenna structures of wide aperture. Original paper appeared in JIEE, vol. 94, part IIIA, March 1947. (a-3 and 4, b-1, c-1, d-1, e-0, f-See Abstract No. 2769)

3012. KESSLER, W. J., "A Study of Atmospheric Direction Finding and Ranging," Florida University, Engineering and Industrial Experiment Station, Progress Report No. 1, Contract No. W36-039-sc-38201, TIP No. U7570; March 1949. ABSTRACT: The initial phases of the wave-shape studies extended to include atmospherics recorded during the night are reported Operational curves, applicable for a spherical earth, relating time intervals between the ground pulse and ionospheric reflections up through the tenth have been constructed for ionosphere heights ranging from 60 to 100 kilometers. Plans for the establishment of a third station in Key West, Florida are reported. The fundamental considerations underlying the operation and design of the Ground-Pulse Direction Finder to be investigated by this laboratory are outlined. The primary phases of this investigation and the design and operation of the special equipment required are described. (a-3, b-3, c-1, d-1, e-0, f-Study. See Abstract No. 2966)

3013. PRESSEY, B. G., "Rotating H-Adcock Direction Finder," Wireless Eng., vol. 26, pp. 85-92; March 1949. ABSTRACT NO. 1: The instrument has a frequency range of 4 to 30 Mcs; the antenna system is about 4 feet over-all. Spheres are fixed to the ends of the antennas to increase their effective height and measures are taken to balance the system throughout the frequency range. By splaying the points of connection of the antenna coil to the horizontal feeders, the polarization error is appreciably reduced. The minimum usable field strength varies between 8 and 2.5μ volts per meter. The instrumental error is not greater than 1/2° and the polarization error is of the same order as that of a U-type Adcock system. ABSTRACT NO. 2: The direction finder is of small dimensions and is for 4-30 Mc/s. The tuned aerial system, which has an overall dimension of ~ 4 ft, is inductively coupled to the receiver through a secondary tuned circuit. Spheres are fixed at the ends of the aerials to increase their capacitance and effective height. Special measures are taken to balance the aerial system and to maintain that balance over the frequency range. By "splaying" the points of connection of the aerial coil to the horizontal feeders an appreciable reduction in polarization error may be affected. The pick-up factor is 0.5-4m over the frequency range and the min.-usable field strength is 2.5-8 μV/m. The instrumental error is ≯ 0.5° and the polarization error ≈ that of a U-type Adcock system. As standard-wave error is not considered applicable to elevated systems the ratio of the horizontal to the vertical pick-up factors (pur) is suggested as an alternative. The pur of this instrument is 0.20-0.13 over the frequency range and the other a fixed instrument covering

10-20 Mc/s. The latter model provides an observer's seat which can be rotated with the aerial system. (a_1-3, a_2-1, b-1, c-1, d-5, e-0, f-Description)

3014. WILLIAMS, A. C., AND ROSCOE, S. N., "Evaluation of Aircraft Instrument Displays for Use with the Omni-Directional Radio Range," University of Illinois. See Department of Commerce PB99799; March 1949. ABSTRACT: 53 pages of drawings, tables, and text covering the following categories: Radio range performance, radio direction finders (VOR), VCR (Omni-Directional Radio Range), U.S. Civil Aeronautics Administration, and CAA 84. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

3015. NATIONAL BUREAU OF STANDARDS, "Standard Direction Finder Measurements, Second Provisional Draft," National Bureau of Standards, Central Radio Propagation Laboratory, Washington, D.C.; 30 March 1949. ABSTRACT: At the present time there is in use by the Services a wide variety of direction finders, which differ in respect to collector systems, bearing indicators, and method of resolving bearing information. The frequency band coverage includes all frequencies from VLF through SHF. Direction finders function on two generally different principles which may be divided into those employing amplitude comparison and those employing phase comparison, or a combination of both principles. The investigation of the effectiveness of the different processes involved in reducing any of the comparative methods to practice, is the subject of these measurements. The adoption of suitable standardized procedure and methods will result in simplification of correlation of data when two or more direction finders are to be compared, or comparisons made by two or more agencies. An effort has been made to follow and adapt previously used methods of measurement and to condense the measurement to an outline of procedure suitable to the majority of types of direction finders. It is, therefore, probable that certain tests have been omitted which would normally be required for a specific design. Such shortcomings may be corrected by supplementing the proposed standardized measurement with suitable data pertinent to the particular design. The measurements have been arranged so that data are first assembled which are informative of the characteristic of the collector system, followed by measurements of the complete system, and finally measurements of the receiver performance. This order was selected in order to place the overall direction finder performance in near relation to the collector system, since the latter appears to be a problem with which these measurements are most directly concerned. (a-1, b-3, c-1, d-1, e-357, f-Reprint of NDRC report dated 12 July 1945 and issued to Navy, August 1947 as NavShips 900, 137. See Abstracts Nos. 2253 and 2357)

3016. BATTISON, J. H., "Directional Antennas for A.M. Broadcasting," Electronics, vol. 22, pp. 101-103; April 1949. ABSTRACT NO. 1: A simplified, practical method of calculating radiation patterns for 2-tower and 3-tower arrays. ABSTRACT NO. 2: Although directional antennas have long been in use by a-m broadcasting stations, some engineers regard them with awe, and surround them with an aura of mystery. Many regard the calculations involved as being beyond their capabilities when, in fact, nothing more than an elementary knowledge of the basic operation of a single antenna and the ability to perform simple trigonometry is required. It is the object of this article to disperse some misconceptions, and simplify directional-antenna calculations for two and three-tower arrays. Almost every textbook opens its antenna section with an illustration of the fundamental laws of radiation from an antenna and these laws will not be repeated here. Since the radio engineer is usually more interested and concerned with the effect of his antenna on co-channel and adjacent-channel stations he will, presumably, prefer to see how to design an antenna to do a specific job. When calculating the radiation pattern for a two-tower array, it is usual to number the towers 1 and 2, and to place them at random. "Random" is used in the sense of being an arbitary placement dependent on the whim of the engineer, subject to the dictates of common sense and necessity. In practice, the engineer usually has an approximate idea of the basic pattern obtainable from certain standard combinations of tower spacing and phasing. From these he can estimate how the final pattern will appear. But eventually the problem boils down to one of trial and error until a pattern is obtained, with reasonable constants, which gives the protection required. Tower 1 is taken as the reference tower and all quantities are stated with reference to this tower. The reference line R-R' is drawn through tower 1, at random. A point P_h is located on a circle whose center is equidistant between towers 1 and 2, and such a distance that lines joining P_h-tower 1, and P_h-tower 2 may be regarded as parallel (actually the error is so slight that it may be ignored in practice). (a_1-3, a_2-1, b-2, c-1, d-1, e-0, f-Analysis)

3017. BURGESS, R. E., "Ground Absorption with Elevated Vertical and Horizontal Dipoles," Wireless Eng., vol. 26, pp. 133-139; April 1949. ABSTRACT: The fraction of the power absorbed in the ground is calculated for dipole heights which are large compared with the wavelength. The dipole is assumed to have a sine-law polar diagram and the energy flow into the ground is evaluated using the Fresnel reflection coefficients which depend upon the wave polarization. The absorption factors are determined for limiting values of ground permittivity. The ground absorption for a vertical dipole is a very slowly varying function of the electrical properties of the ground and is very nearly 0.4 for most practical conditions. It is appreciably greater than that of a horizontal dipole on account of the Brewster phenomenon. The results obtained are compared with those derived earlier by Strutt, Niessen, and Sommerfeld and Renner. The noise in an antenna system due to thermal radiation from the ground is evaluated directly using thermodynamical principles and is shown to be consistent with the value derived by application of the reciprocity principle. Brief consideration is given to the ground absorption for antenna arrays. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

3018. EVERHART, A. G., "Direction Finding Kit MX-536/GRD," Federal Telecommunications Laboratories, Nutley, New Jersey, Progress Report No. 4, Contract No. W33-038-ac-21373, TIP No. U6516; April 1949. ABSTRACT: The contract calls for design and manufacture of 34 VHF and HF automatic direction finders; production drawings for these; and 4 installation kits to adapt the units for use with the CPS-6 radar installation. The VHF antenna was assembled for mechanical checks. The Cyclohm motor had an excessive temperature rise. All but 1 sample power- and audio-transformers operated satisfactorily. A filter unit circuit designed to deliver 8 v. r. m. s. into a 76-Ω balanced output with less than 3% total harmonic distortion was made up. Phase adjustment for each filter section was obtained by a feed-back circuit from the output of the amplifier to the input of the 30 c. filter choke. A total phase change of 20° was obtained with a small change in amplitude. Schematics are presented for power supply amplifier PP-385/GRD; radio receiver RC-264/GRD; and HF power, HF receiver and goniometer. (a-3, b-3, c-1, d-1, e-0, f-Modification description)

3019. GUERTLER, R., "Impedance Transformation in Folded Dipoles," Proc. IRE, (Australia), vol. 10, pp. 95-100; April 1949. See also Proc IRE, vol. 38, pp. 1042-1047; September 1950. ABSTRACT: The impedance of a folded dipole, relative to that of a simple dipole, may be adjusted by the use of conductors of different diameters for the separate elements. Increased impedance ratios can be obtained by the use of additional elements. Approximate formulas are developed for calculating the impedance ratio when the current ratio is known. Measurements confirm the practical applicability of the formulas. (a-1, b-1, c-1, d-11, e-0, f-Experimental analysis)

3020. PRESSEY, B. G., "H.F. Transmitter for D.F. Measurements," Wireless Eng., vol. 26, pp. 124-128; April 1949. ABSTRACT NO. 1: Discussion of the principles of design and the details of construction and operation of an elevated screened-loop transmitter. The loop can be rotated about a horizontal axis to produce a wave of known polarization for the measurement of the polarization error of direction-finding systems. The parallax error that occurs if a dipole is used as the radiator is thus eliminated. ABSTRACT NO. 2: Polarization error of direction finder can be conveniently measured using elevated transmitter which is capable of producing test signal of known polarization; design, construction and operation of such transmitter covering frequency range 3-20 Mc; use of loop antenna which can be rotated about horizontal axis so as to produce any desired polarization. (a_1-3, a_2-3, b-2, c-1, d-5, e-866, f-Discussion)

3021. SALMOND, D. S., "Evaluation of Collins Type 51R VHF Navigation Receiver for VOR-VHF-ADF Suitability in Single-Place Jet Type Aircraft (FH-1, BuNo. 111751)," USN Naval Air Test Center, Patuxent River, Final Report Project TED No. PTR EL 954; Serial No. ET331-10; TIP No. U4524; 21 April 1949. ABSTRACT: The VOR Receiver can be used as an automatic radio direction finder in which the VOR compass card of the radio magnetic indicator (RMI) rotates in accordance with intelligence received from the flux gate compass system of the aircraft. The installation of the VOR equipment for ADF requires only the receiver, the power supply, the serve amplifier, the omnibearing indicator, and the RMI. For the test in the single-place jet type aircraft, a plastic nose was installed to house a specially built antenna. Another antenna was installed in the pilot's canopy. The 51-R receiving equipment was connected directly to the P-3 flux gate compass which is standard equipment in the FH-1 aircraft. The nose antenna gave excellent results and provided 360° coverage at less than line-of-sight distances. The card of the VOR indicator followed the P-3 flux gate compass instantly. Each of the 12 pilots who tested the 51-R equipment in the jet plane liked it better than the LF ADF. Presentation of the aircraft heading and the mag-

netic bearing relative to the VOR station on 1 instrument has the advantage that drift can be solved continuously with little effort. The only disadvantage may be the lack of VOR stations on a desired course or in some localities. (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

3022. LEONARD, J. D., "Array Development for an AN/APN-12 Lobe-Switching Equipment," Ohio State University Research Foundation, Report on Antenna Radiation Characteristics; TIP No. U9406; 30 April 1949. ABSTRACT: Two types of arrays were investigated; the first consisted of a single stub with a variable number of reflectors, and the second of 2 driven elements fed inphase with a variable number of reflectors. Of the first type of array, the combination of 0.25λ spacing, and length with 3 reflectors gave the most promising results and a series of patterns were taken with the reflector lengths varied from 5 to 1 cm. at a wave length of 10 cm. The array using 3 cm. reflectors gave a cardioid-like pattern while that with 2.5-cm. reflectors gave a sharper front lobe with a small lobe in the rear. The array using 0.3λ reflectors was investigated over a 30% frequency range by varying the length and spacing of the elements rather than the wave length. There was little difference in the pattern over this frequency band. In the second type, 2 quarter-wave stubs, spaced λ/2 apart and fed inphase, were measured using 1 to 3 reflectors 0.3λ high and spaced at various distances behind the driven elements. The driven 2-element array with no reflectors gave a very desirable front lobe but had an identical back lobe. The driven 2-element array, using 1 reflector spaced midway between and 0.25λ behind the driven elements, gave a suitable forward lobe and a reduced back lobe. The array using 2 reflectors each spaced 0.25λ behind the 2 driven elements had a desirable front lobe with a small back lobe. The most satisfactory pattern obtained was produced by the 2 driven elements with 3 reflectors; this 5-element array most nearly approached the ideal situation. (a-3, b-3, c-1, d-1, e-0, f-Study)

3023. BEARD, M., "The Multiple-Track Range, Proc. IEE (London), vol. 96, pp. 245-251; May 1949. ABSTRACT: A short-distance radio navigational aid similar in principle to Gee and Loran. Experimental equipment which was used near Sydney is described; accuracy and results of trials are discussed. (a-3, b-1, c-1, d-5, e-0, f-Description)

3024. BUSIGNIES, H., AND DISHAL, M., "Some Relations between Speed of Indication, Bandwidth, and Signal-to-Random-Noise Ratio in Radio Navigation and Direction Finding," Proc. IRE, vol. 37, pp. 478-488; May 1949. See also Elec. Commun., vol. 26, no. 3, pp. 228-242; September 1949. ABSTRACT: The total bandwidth required for navigation and direction-finding systems is quite small ($\lesssim$ 100 cps or so), complex waveform provided that a filter can be designed with a number of very narrow pass bands occurring at the steady-state Fourier components of the complex signal. Such a "comb" filter is discussed briefly. Systems for which the output signal-to-noise ratio is better than the input carrier-to-noise ratio have improvement thresholds, but many navigation systems can give satisfactory information an output signal-to-noise ratios below these thresholds. Single-sideband and double-sideband AM produce the most sensitive systems under such conditions. The phenomenon of "apparent demodulation" is discussed for systems having the post-detection bandwidth Δf_v narrower than the predetection bandwidth Δf_{IF} and carrier-to-noise ratio appreciably less than unity at the input to the final detector. A relation between the available power, the output signal-to-noise ratio $(S/N)_v$ required for satisfactory indication, the percentage modulation, m, Δf_{IF}, and Δf_v is obtained for a double-sideband AM system with a linear final detector; this relation depends markedly on whether the quantity $4(\Delta f_{IF}/\Delta f_v)\,(N/S)_v{}^2 m^2$ is greater than or less than unity. (a-2, b-1, c-1, d-1, e-49, f-Analysis)

3025 FRATIANNI, S. V., "The Equivalent Selectivity of Transformer-Coupled Loop-Antenna Input Circuits," NRL Report 3464; May 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

3026. ROESCHEN, E., "Measurements on Frame Aerials," Funk und Ton, vol. 3, pp. 271-277; May 1949. ABSTRACT: The dependence of the effective height of a frame antenna on the number of turns of the winding and on the frequency is discussed. Measurements on tuned antennas, with and without screens, are tabulated. Screening increases the damping by about 15 per cent. (a-3, b-1, c-4, d-4, e-0, f-Experimental study)

3027. BOUWKAMP, C. J., "On the Effective Length of a Linear Transmitting Antenna," Philips Research Reports, vol. 4, pp. 179-188; June 1949. ABSTRACT: King's definition of effective length of a cylindrical center-driven antenna with a sine distribution of current is consistent with a new general extension for any distribution of antenna current. As an example, results for a toploaded antenna are given in tables and diagrams. (a-3, b-1, c-1, d-12, e-0, f-Theory)

3028. BROWN, C. R., "Omnidirectional Circular Polarised DF Antennas," Federal Telecommunications Laboratories, Nutley, New Jersey, Quarterly Progress Report No. 4, TIP No. U8106; June 1949. ABSTRACT: A 1/4-in. diameter (about 0.02λ) Wheeler type helix antenna system had extremely low sensitivity (at least 50-60 db. below a tuned dipole). A 1-in. diameter (about 0.1λ) loop and dipole antenna had a poor axial ratio characteristic. A 1-in. diameter balanced helix directional pair showed a favorable axial ratio characteristic over 550-1650 mc., but the axial ratios over that range were poor for a 3-in. diameter balanced helix directional pair and a 2-in. diameter tilted element loop. The directional pair patterns of all 3 systems were considerably better than those of the unbalanced systems previously discussed. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstracts Nos. 2956, 2980, and 3009)

3029. CORNELIUS, P., "A Simple Vector Diagram for High-Frequency Lines," Commun. News, vol. 10, pp. 33-40; June 1949. ABSTRACT: The input impedance of a lossless hf transmission line can be determined, for a given terminating impedance, by means of a Smith chart; the attenuation is only given if the line is terminated by its characteristic impedance. The impedance of a line with losses and terminated arbitrarily can be determined by the vector method here given, but the attenuation is only given for termination by the characteristic impedance. The vector method is also used to derive various well-known relations. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

3030. EVERHART, A. G., "Direction Finding Kit MX-536/GRD," Federal Telecommunications Laboratories, Nutley, New Jersey. Progress Report No. 6, Contract No. W33-038-ac-21373, dated May 1949; TIP No. U6517; June 1949. ABSTRACT. Preliminary tests of the HF power supply and receiver showed 0.5μv. average over-all sensitivity at a 2:1 S/N ratio. In D/F checks of an earlier model of MX-536/GRD, using a CPN-18 radar equipment, on 134, 126, and 116 mc., 70% of the bearings were within ± 5%; the remainder were up to 10%. For flights directly across the station, good bearings held up to 60° angles or better. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See earlier abstracts with same title)

3031. MEIER, A. S., AND SUMMERS, W. P., "Measured Impedance of Vertical Antennas over Finite Ground Planes," Proc. IRE, vol. 37, pp. 609-616; June 1949. ABSTRACT NO. 1: For a ground plane of dimensions small compared with λ, the impedance is a damped oscillating function of λ and the ground-plane dimensions. Impedance variations of -5 to -20 per cent were found with a circular ground plane; the corresponding variations for a square ground plane were about half as great, except when the ground plane was small. Impedance is relatively independent of antenna thickness. At microwave frequencies, measurements were made by a modified Chipman method the merits of which are compared with those of the conventional slotted-line standing-wave method. ABSTRACT NO. 2: An investigation was made of the relation of the impedance of a vertical aerial over a finite ground plane as a function of the size and shape of the ground plane when dimensions of the ground plane are relatively small in terms of wavelength. It was found that the input impedance is a damped oscillating function of wavelength and ground-plane dimensions, the impedance of a circular ground plane varying from ± 5 to ± 20%. Similar variations were observed on a square ground plane, which were ≈ 50% of those of the circular ground plane, except when the dimensions of the ground plane were small. In general, it was found that the impedance is quite critical with respect to the size and shape of the ground plane, and relatively independent of the thickness of the aerial. Measurements were made at microwaves by a modified Chipman method capable of measuring small differences in aerial impedance. This method was compared with the more conventional slotted-line standing-wave method. (a_1-5, a_2-1, b-1, c-1, d-1, e-0, f-Experimental analysis)

3032. MORGAN, G. A., "Analysis and Calibration of Loop Probes for Use in Measuring Interference Fields," NRL Report 3486. See also Department of Commerce PB111046; June 1949. ABSTRACT: A small shielded-loop antenna, to be used as a probe for indicating and measuring radio-frequency interference fields from electrical equipment, has been analysed. A method of calibration, which uses another small shielded loop to establish a radio-frequency field of known characteristics, has been developed, and its accuracy and reliability are proved experimentally. Loop probes of the approximate dimensions of those analysed have been shown to be usable for

the desired application at frequencies below approximately 400 Mc only, both because of unsatisfactory response characteristics and because of difficulties of calibration at higher frequencies. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3033. WONNELL, T. S., AND FENIMORE, G. E., "CAA Low Frequency Omnirange," U.S. Civil Aeronautics Administration, Radio Development Division, Indianapolis, Indiana. See Department of Commerce PB103584; June 1949. ABSTRACT: A low-frequency omnirange has been developed which provides a long-range air navigational aid which is simple to install, maintain, and operate. The theory of operation of the omnirange system is given, and ground and airborne equipments are described. (a-3, b-3, c-1, d-1, e-0, f-Omnirange description)

3034. ANONYMOUS, "Decca Developments," Aeroplane, vol. 76, no. 1982, pp. 641-642; 3 June 1949. See also Flight, vol. 55, no. 2110, pp. 652-654; 2 June 1949. ABSTRACT: Work done to adapt system for use in air; recent developments described. Including Flight Plotter and Flight Log; Plotter still calls for manual operation, but Log presents pilot with continuous plot of Decca readings; illustrations. (a-3, b-2, c-1, d-1, e-0, f-Decca survey)

3035. WILSON, W., "Radiolocation," Electrical Engr. & Merchandiser, vol. 26, no. 3, pp. 77-84;15 June 1949. ABSTRACT: Notes on development of land, marine and aircraft equipment and future applications in navigation and industry; principles of radiolocation, ionosphere investigations; application to solid objects; plan position indicators; H_2S scheme; dark trace screens; 10 and 3-cm waves; Gee system; GH and Oboe; Decca scheme. (a-3, b-2, c-1, d-11, e-0, f-Summary)

3036. ANONYMOUS, "A Study of Directional Antenna Systems for Radio D/F Purposes," Syracuse University, Progress Report No. 4, Contract No. W28-099-ac-458, 15 March - 15 June 1949; TIP No. U8515; ca 30 June 1949. ABSTRACT: A solution was obtained for the Wullenwever array of discreet elements based on the theoretical pattern of a single element placed before a reflector. A previous solution assumed a continuous current distribution. The theoretical solution checked with experimental results. The locations of the transmitting and receiving antennas were changed; their separation remains 20 wave lengths at the center-band frequency of 300 mc. but the distance to the nearest building is 90 wave lengths instead of 30. The wood-supported cylindrical reflector was changed to a stainless-steel frame work covered with wire mesh. The cones originally used as active elements were replaced by rods which can be adjusted to the correct quarter-wave length for each pattern. The dimensions of the array were slightly changed. Further accuracy was obtained through determining the lengths of the delay lines by electrical rather than physical measurements. Patterns taken at 225, 300, and 400 mc. for various array conditions are presented. Fourier analyses were made of several patterns and of 2 idealized patterns having no side lobes. (a-3, b-3, c-1, d-1, e-0, f-Study report. Refer to AD51-062 for earlier report)

3037. ANONYMOUS, "D/F Signal to Noise Improvement Unit," Crystal Research Labs, Inc., Interim Engineering Report, 22 April to 22 July 1949; TIP No. R3055; 23 July 1949. ABSTRACT: The problems involved in increasing an input S/N ratio of 1:10 to a usable signal are discussed. Although the S/N ratio theoretically can be increased many times, practical considerations limit the amount of enhancement available. Loop enhancement appears most feasible. The possibilities of using 1 or several delay lines and the difficulties associated with the use of either system are outlined. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3067)

3038. BATTISON, J. H., "Electronic Navigation Aids in United Kingdom," Aero Digest, vol. 59, no. 1, pp. 20-21, 98-99; July 1949. ABSTRACT: Information on provisions and plans laid to control and navigate the flow of aircraft; Consol, Gee, and Loran operations; Decca System of navigation; charts included. (a-3, b-1, c-1, d-1, e-0, f-Air navigation equipment)

3039. DIGIACOMO, A., "Preliminary Investigation of Principle of Radio Direction Finding to Be Employed in Radio Set AN/TRD-4," Coles Signal Lab., Signal Corps Engineering Labs., TIP No. R3356; 1 July 1949. ABSTRACT: Tests were conducted to compare the performance of an inductive goniometer as used in radio sets SCR-291 and SCR-502 and an electronic goniometer as used in radio set AN/CRD-2. The effects of all components and design features which are not a part of or peculiar to the goniometer systems were excluded. The results showed a close correlation in performance. At particular frequencies, the electronic goniometer was superior but at other frequencies the advantage lay with the inductive goniometer. In instances when 1 goniometer was superior, the difference between the 2 types was not significantly greater than might normally be observed between several goniometers of the same type. Aside from the performance characteristics, the ease of manufacturing, operating and maintaining the systems must be considered in determining their relative merits. There was some evidence to indicate that the electronic goniometer, because of its increased complexity, is inferior in these respects. Comparison tests were confined to transportable systems due to the nonavailability of mobile systems using either goniometer. On the basis of present information, the electronic and inductive goniometer principles appeared equally applicable in the development of radio set AN/TRD-4. Further investigation is recommended. (a-3, b-3, c-1, d-1, e-0, f-Study)

3040. HOPKINS, G. H., AND HORNER, F., "Direction-Finding Site Errors at Very High Frequencies," Proc. IEE (London), Part III, vol. 96, no. 42, pp. 321-332: Disc., pp. 340-345; July 1949. ABSTRACT NO. 1: Theoretical and practical investigations are described, concerned mainly with Adcock-type direction finders. The variation in error with the position of various types of reflecting obstacle is examined and the use of error charts for locating such sources of error on a site is described. Of several practical methods suggested for locating the obstacles, two have been used with success, namely the variation of the azimuth or of the frequency of the transmitter. Methods of suppressing unwanted reflections are considered. A criterion is suggested to express the susceptibility of a direction finder to site error, and is applied to well-known instrumental types. ABSTRACT NO. 2: Attention is mainly directed to Adcock type aerial systems; criterion is suggested to express susceptibility of direction finder to site error, and is applied to well known instrumental types; variations in error with azimuth and elevation angle due to "point," "linear" and "sheet" charts which may be useful in locating sources of erro. on site are discussed. (a_1-3, a_2-3, b-1, c-1, d-5, e-0, f-Study)

3041. KEARY, H. F., "Rotating Goniometer for the Low Frequency, High Power Omni-Range," Civil Aeronautics Administration, Technical Development and Evaluation Center, Indianapolis, Indiana; July 1949. ABSTRACT: 10 Pages of photos and text. Report CAA TDR 70. (a-4, b-3, c-1, d-1, e-0, f-Description)

3042. KEEN, H. J., "UHF Receiver for Direction Finding Kit MX-536/GRD (Experimental Model)," Lavoie Labs, Interim Engineering Report; June 1949. TIP No. R2481; 10 July 1949. ABSTRACT: The IF amplifiers were completed. Schematic diagrams are presented of the AVC and squelch circuits found satisfactory for use in production models. Tests showed that a corrugated cabinet had very good heat dissipation qualities. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3043. PORTIER, M., "Loran," Onde Elec., vol. 29, pp. 286-304; July 1949. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-Loran)

3044. ROSS, W., "The Specification and Measurement of Polarization Errors in Adcock-Type Direction Finders," Proc. IEE (London), Part III, vol. 96, pp. 269-277; July 1949. ABSTRACT NO. 1: For instruments erected not more than about λ/4 above the ground, the "standard wave error" is the best specification of polarisation error, while the "pick up ratio" for wanted and unwanted fields is appropriate for more elevated systems. The method of test using a nearby elevated transmitter is described in detail; in the frequency range 3 to 30 Mc a loop up to about 1.6 m in diameter at a distance of not less than 100 m may be used. For frequencies below 3 Mc the "local injection" method of test may be more practicable. The performance of a direction finder is very dependent on the electrical properties of the site. ABSTRACT NO. 2: The respective merits of the "standard-wave error" introduced by Barfield, and the "pick-up ratio" for wanted and unwanted fields suggested by several other workers, are examined. It is recommended that the former be used for Adcock direction-finders erected not higher than about 1/4 λ above ground, while the latter is appropriate for more elevated systems. Comparison of direction-finders falling into different categories can only be carried out if a complete specification of polarization error performance over all relevant angles of incidence is available. The problems involved in using a relatively nearby test transmitter are discussed. For frequencies above ~ 3 Mc/s it is shown that a suitable local radiator consists of a rotatable closed loop used at moderate elevations, and at distances ≮ λ. The effects of loop size are discussed, and it is shown that adequately large loops

are practicable; for example, for frequencies in the range 3-30 Mc/s, a loop up to about 5 ft in diameter may be used, providing the distance is ≮ 100 m. For frequencies < 2-3 Mc/s it is suggested that the "local-injection" method due to Barfield may be more practicable than a radiation method. (a_1-5, a_2-5, b-1, c-1, d-5, e-230, f-See earlier abstract, dated 21 March 1944. See also Abstract No. 3112)

3045. DE WALDEN, S., AND SWALLOW, J. C., "The Relative Merits of Presentation of Bearings by Aural-Null and Twin-Channel Cathode-Ray Direction-Finders," JIEE, Part III, vol. 96, pp. 307-320; July 1949. ABSTRACT: The relative merit of the display of radio bearings and sense by aural-null and twin-channel cathode-ray goniometers is examined as a function of various characteristics of the signal. The visual method of bearing display is shown to be superior except in its ineffectiveness in operating at very low S/N ratios. It is shown quantitatively that this disadvantage is slight and could be overcome by a suitable narrowing of the receiver bandwidth. The advantage of the visual method is specially pronounced when the signal received includes an appreciable phase-quadrature component. Similar conclusions are reached regarding the performance of the associated methods of sense display. (a-1, b-1, c-1, d-5, e-467, f-Theory and experiment)

3046. WALTERS, A. W., "Sleeve Antenna Considerations for Task Fleet Flagship," NRL Report 3494; July 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

3047. CLEMENT, P. R., "High-Frequency Transmission Line Chart," Electronics, vol. 22, pp. 104-105; August 1949. ABSTRACT: Determination of input impedances and matching-stub dimensions is simplified by means of a chart in which straight lines are used instead of curves as in circle or Smith diagrams. (a-3, b-2, c-1, d-1, e-0, f-Transmission lines)

3048. HORNER, E., "Some Experiments on the Accuracy of Bearings Taken on an Aural-Null Direction-Finder," Instn. Elect. Engrs., Paper No. 868, p. 13; August 1949. ABSTRACT: The paper describes some tests to determine how the accuracy of a bearing taken on an aural-null rotating H-Adcock Direction-Finder depends on the width of the min. and on the receiver output noise-level. The results pertain to bearings taken on a steady tone-modulated signal by an experienced observer working under good conditions. They indicate that bearings taken under these conditions will have a standard deviation of between 1/40 and 1/20 of the arc of silence except for very small arcs, even when the bearings are derived from very few oscillations of the aerial system. Accuracy is improved if the number of complete oscillations is > about 5. Differences of at least two to one in the standard deviation of observed bearings may occur between different observers and with one observer at different times. Compared with these changes, any changes due to the use of different receiver output noise-levels are considered to be small. Accuracy is degraded if the angle through which the aerial is swung is increased to improve the quality of the signal at the limits of the swing. (a-2, b-1, c-1, d-1, e-0, f-Experimental study)

3049. KAHAN, T., AND ECKART, G., "On the Electromagnetic Surface Wave of Sommerfeld," Physical Review, vol. 76, pp. 406-410; August 1949. ABSTRACT: It is proved that Sommerfeld's well known electromagnetic surface wave does not exist in the radiation of a Hertzian dipole over a plane earth because it does not fulfill the so called radiation condition. The path of integration chosen by Sommerfeld is correct but there is another saddle-point overlooked by this author which just annuls the surface wave due to the residue. These results are in agreement with Burrow's measurements. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3050. LORENZ, L. J., ET AL., "Faired-In ADF Installations," Electronics Research, Inc., Final Report, Contract No. NOa(s)9269; TIP No. R3281; August 1949. ABSTRACT: An investigation was made of flush installations of automatic direction finder (ADF) loop and sense antennas at different locations on medium sized aircraft. Preliminary measurements were made on simulated installations on a shielded cage and on a full-scale mock-up of an aircraft to determine installation parameters such as diameter, depth, and location of recess or well. It was not necessary to sacrifice electrical performance to achieve a zero-drag installation in the case of (top, nose, or belly) locations near the center line of the aricraft. However, it was necessary to employ some kind of electrical compensation as well as the conventional mechanical (cam) compensation. Good sense antenna performance is not always possible at a nose location unless the sense antenna can be placed a sufficient distance above or below the electric field neutral-plane of the aircraft. The compensating effect obtained using various inductor-loop configurations with conventionally-mounted and flush-mounted installations was investigated. A single-element inductor compensates for 1 form of error-curve if the plane of the element is fore and aft, and compensates for the inverted form of error-curve if the plane of the element is athwartship. A new type of compensating element which was evolved for a nose installation consisted of a wide metal wall and top hat mounted in front of the loop. This configuration produced overcompensation where the conventional inductor-loops had little effect. No configuration was found, however, that showed promise of reducing the dispersal, or spread, of the individual error curves with frequency. A ring-type sense antenna was evolved which can be adapted for many flush installations. This antenna was as effective as the conventional sense stubs and plates, was light in weight, and suitable for installation in the same opening for the flush-mounted loop without interfering with the loop. Several minor investigations were also made. One problem was to determine whether or not a loop mounted near the armor plate in a canopy of a fighter aircraft would have bearing errors should the armor plate become magnetised. Even strong static magnetic fields did not adversely affect loop performance. Another problem was that the bearing errors were not the same when measured on the same aircraft at different locations on the airport, although at any 1 location the data could be repeated from 1 day to the next. Differences as large as 9° existed between the 2 locations at opposite ends of the Evansville Municipal airport even though both were 600 ft. away from the nearest metal fences. (a-1, b-3, c-1, d-1, e-0, f-Study)

3051. WALTERS, A. W., "Broadband Communication Antennas for Destroyers of the USS 693 Class," NRL Report 3515; August 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

3052. WENNERBERG, G., "V.H.F. Direction Finder for Light Planes," Electronics, vol. 22, no. 8, pp. 118-140; August 1949. ABSTRACT: This omni-range system provides azimuth information directly in degrees for an aircraft in any position within the line-of-sight range of the transmitting station. The frequency used is within the band 108 to 132 Mc and the system has a useful working range of 50 to 100 miles. The basic principle is the same as that of the German Sonne system; navigational information is supplied as the time difference at the receiving point between a nondirectional signal and one transmitted on a rotating beam from the same transmitter. (a-5, b-2, c-1, d-1, e-0, f-Description)

3053. WRYE, L. M., "Ratio Indicator," NRL Report 3518; 16 August 1949. ABSTRACT: Determination of a ratio indicator required the design and construction of equipment to give cathode-ray-tube (crt) presentation of the ratio of amplitudes of simultaneously occurring and otherwise identical pulse pairs. The presentation would be a spot on a cathode-ray tube whose horizontal displacement is a measure of the ratio of amplitudes of one pulse pair and whose vertical displacement is a measure of the ratio of amplitudes of another pulse pair. A circuit has been developed which produces a single voltage pulse the amplitude of which is proportional to the log of the ratio of the amplitudes of two input pulses. Input voltages of less than 1 volt to greater than 40 volts may be accommodated, and pulse lengths as short as 0.25 microsecond may be used. The equipment in which this circuit is employed displays the ratio as a spot on a cathode-ray tube with deflection proportional to the log of the ratio. (a-1, b-3, c-1, d-1, e-803, f-Description)

3054. BANERJEE, S. S., AND MEHROTRA, R. R., "Radiation Resistance of Skew-Wire Radio-Frequency Transmission Lines," Indian Jour. Phys., vol. 23, pp. 403-409; September 1949. ABSTRACT: A general formula, applicable for any orientation of the lines with respect to each other, is derived and applied to six special cases of practical interest. Results for one of these cases were confirmed experimentally. (a-3, b-1, c-1, d-8, e-0, f-Study)

3055. BELL, D. A., "Gain of Aerial Systems," Wireless Eng., vol. 26, pp. 306-312; September 1949. ABSTRACT: The maximum gain of an antenna of given aperture depends on the phase distribution of the illumination of the aperture. Three cases are considered, in order of increasing gain: (a) uniform-phase radiators (broadside arrays and "optical" radiators), (b) radiators, with effective phase-shift of π (end-fire antennas of all kinds), and (c) antennas with closely-spaced phase reversals (high-gain short antennas). (a-3, b-2, c-1, d-5, e-0, f-Antenna analysis)

3056. BURGMANN, V. D., "Distance-Measuring Equipment for Aircraft Navigation," Proc. IEE, vol. 96, pp. 395-402; September

1949. ABSTRACT: An airborne light-weight radar set works in conjunction with a responder beacon on the ground. The radar transmitter sends out a stream of pulses which are returned by the beacon at a slightly different frequency. The time interval between the outgoing and corresponding return pulse is measured automatically and shown on a meter calibrated in miles. The design of the airborne set and results obtained in trials on an air route are discussed. Well-established techniques are used. (a-5, b-1, c-1, d-5, e-0, f-Description)

3057. GARFINKEL, B., "Least Square Determination of Position from Radio Doppler Data," Ballistic Research Labs., Aberdeen Proving Ground, TIP No. R2224; September 1949. ABSTRACT: When the number of radio-doppler receiving stations exceeds three, the problem of calculating the position of a missile in space is overdetermined. Here we design a method of least squares which overcomes the difficulty arising from the presence of a non-linear equation. The resulting solution is short, as well as accurate, and is identical in form with the one previously developed for the case of three stations. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3058. GIACOLETTO, L. J., AND STIBER, S., "Medium-Frequency Crossed-Loop Direction Finder with Instantaneous Unidirectional Visual Presentation," Proc. IRE, vol. 37, pp. 1082-1088; September 1949. ABSTRACT: A radio direction finder is described which uses a crossed-loop collector system, electronic switch, single superheterodyne receiver, and synchronous rectifier to produce an instantaneous unidirectional visual indication of the direction of arrival of an electromagnetic wave. Design data and operating characteristics are considered, with details given of the new components. (a-3, b-1, c-1, d-1, e-0, f-Description)

3059. GUERTHLER, R., "Impedance Transformation in Folded Dipoles," Jour. Brit. IRE, vol. 9, pp. 344-350; September 1949. ABSTRACT: The impedance of a folded dipole relative to that of a simple dipole can be adjusted by using conductors of different diameters or the separate elements of the folded dipole. Increased impedance ratios can be obtained by using additional elements. The impedance ratio can be obtained from the current ratio; formulas are derived. Practical examples are given. Reprinted from Proc. IRE (Australia); April 1949. (a-5, b-1, c-1, d-5, e-0, f-Theory)

3060. KELLEHER, K. S., "Antenna Wavefront Problems," NRL Report 3530. See also Department of Commerce PB99488; September 1949. ABSTRACT: By means of a vector notation for surfaces, relations are derived among an incident wavefront, reflector, and reflected wavefront. A method is introduced for evaluating the deviation of a wavefront surface from a plane. A number of problems, including an analysis of the wavefront from a Foster Scanner antenna, are included in order to indicate the simplicity and utility of the analysis. (a-3, b-3, c-1, d-1, e-0, f-Study)

3061. MUGRIDGE, A. H., AND REDGMENT, P. G., "The Wullenweber: The Theory Design and Experimental Investigation of the Ex-German Wide-Aperture H. F. D. F. Wullenweber at Skisby, North Jutland, Denmark," Admiralty Signal & Radar Establishment (British) Monograph No. 806; ASTIA No. AD-102793; September 1949. ABSTRACT: In designing a D/F system to cover 360° and working upon the "sector D/F" principle it is convenient to arrange a number of aerials evenly around the circumference of a circle. The reception pattern of each of these elements can be made of cardioid in shape by backing each with a suitable parasitic reflector. A device of this sort is necessary to ensure that the reception diagram of any array constituted of these elements should be of a unilateral character. For any given direction the required "sector D/F," is obtained by using the aerials in a suitable arc of this circle. The bearing can be determined by the phase-comparison method employing the signals from the two halves of the whole operative sector as two spaced arrays, the signals from the arrays being combined either additively or differentially. The difficulty arising with phase-measuring devices owing to the dependence of their calibration upon frequency can be avoided by using delay-lines. Besides serving its fundamental purpose as a phase equaliser for determining the bearing, the phase-delay line used in such a system can be designed to take into account the fact that the aerial elements lie on the arc of a circle. By using a non-uniform delay line the phases of the individual elements of the arrays can be corrected so that the signals contributed by each element are equivalent to those which would be contributed by the corresponding elements of equivalent flat arrays. Such a correction can only be effected for small angles of incidence on either side of the axis of symmetry of the sector. The next sector is covered by switching out one aerial at one end of the arc and bringing in another at the other end. Within antennae in use this effectively constitutes n sector D/F and therefore the angle between sectors is $2\pi/n$. The concepts discussed were applied practically by the Germans in developing the HF D/F Wullenweber. The installation which was put into operation in Denmark was developed by Telefunken and was designed to cover the frequency band 6-20 Mc/s. The aerial array of the system consisted of 40 vertical wide-band aerial elements equally spaced around the circumference of a circle approximately 130 yd in diameter. A "parasitic" reflector in the form of a flat array of vertical conductors was placed behind each aerial unit. These screens were arranged on the circumference of a circle approximately 100 yd in diameter concentric with that of the aerial system. (a-1, b-3, c-1, d-5, e-187, f-Comprehensive study)

3062. TUCKER, J. W., "Passive Bearing Finder. Report No. 1, Effect of Synchronised Time-Gating on the Signal-to-Noise Ratio of Broadband Amplifier," NRL Report 3463; September 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3063. KEEN, H. J., AND PHILLIPS, W., "UHF Receiver for Direction Finding Kit MX-536/GRD (Experimental Model)," Lavoie Labs., Interim Engineering Report, Contract No. W28-099-ac-77, TIP No. R2482; August 1949; 10 September 1949. ABSTRACT: Final models of the harmonic generator, dual conversion IF amplifier, and AVC and squelch; development of the 100- to 200-mc. receiver RF head; and the prototype model of the 200- to 400-mc. receiver RF head were completed. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See earlier Abstract No. 3042)

3064. LEPAGE, W. R., HARRINGTON, R. F., AND SCHLECHT, M. F., "A Study of Directional Antenna Systems for Radio D/F Purposes," Syracuse University, Institute of Industrial Research, Final Report, Contract No. W28-099-ac-458; TIP No. U10968; 15 September 1949. ABSTRACT: Basic solutions are given for the field patterns of a circular array consisting of a continuous current sheet or discrete elements. Good agreement was obtained between experiments and a theory which predicts amplitide and phase information for the field pattern of a single element in front of a cylinder. The Wullenwever array was approximated by assuming a continuous current sheet, each integration element of which had a field pattern of the form predicted by that theory. This assumption also seemed justified for discrete elements spaced at less than one-half wave length. For greater spacings a summation of 1 term for each element was used. The beam widths of experimental arrays were 15° to 40°. Phase distortion was worse in the circular array than in the Wullenwever type. Results of coupling the feed system capacitively to a 5-element Wullenwever array were encouraging. Theoretical horizontal-plane patterns obtained for an Adcock in which a pair of cophasally-fed elements replaced each element of the ordinary H-Adcock to give a broadside effect showed the expected reinforcement advantageous when the base of the Adcock was more than one-half wave length. Tests with an automatic pattern recording system showed that patterns obtained when transmitting and receiving were the same. Pertinent dimensions of the Wullenwever array for various frequencies are given in terms of wave lengths. (a-3, b-3, c-1, d-1, e-158, f-Wullenwever. See Abstract No. 3036)

3065. LUCKE, W. S., "Electric Dipoles in the Presence of Elliptic and Circular Cylinders," Stanford Research Institute, Technical Report No. 1, Project No. 188; ASTIA AD-69205; 26 September 1949. ABSTRACT: The problem of the far zone electromagnetic fields of electric radiators in the presence of an infinitely long perfectly conducting cylinder of elliptic or circular cross-section has attracted past interest which has culminated in its approximate solution. The analysis reported herein represents the application of the Green's function method to this problem. By this method it is demonstrated that one can obtain the exact relation between the far zone fields and the current vectors of the dipoles, assuming a vanishing tangential field on the cylinder. Sections II and III deal with particular orientations of the dipoles in respect to the cylinder. The problems of dipoles parallel to the axes of cylinders are treated in II-A and III-A respectively; the problems of dipoles in a plane perpendicular to the axes of circular and elliptic cylinders are treated in II-B and III-B. Section IV is devoted to the problem of an arbitrarily oriented dipole. Polar diagrams of the results of sample calculations are included. Among them is the case of a dipole in the presence of a flat strip of infinite length and finite width, i.e., a degenerate elliptic cylinder. This is a form of the problem of a finite ground plane and gives results which agree with experimental results. Other sample calculations deal with elliptic cylinders of mild eccentricities. These calculations give results which are applicable to the study of the effect of wings, fuselage, and tail surfaces on the radiation properties of antennas mounted on aircraft or missiles. (a-1, b-3, c-1, d-1, e-750, f-Analytical study)

3066. KESSLER, W. J., "Direction Finding and Ranging on Atmospherics," Florida University, Engineering and Industrial Experiment Station, Quarterly Progress Report No. 3, Contract No. W36-039-sc-38201, TIP No. U8508; ca 30 September 1949. ABSTRACT: The results of the analysis of the available wave-form data for the independent determination of the virtual ionosphere height pertinent to the propagation of atmospherics are described. The results of the study regarding the interpolation of the error-trend curves for the more accurate determination of distance and ionosphere height from suitable waveform data are reported. The preliminary laboratory studies constituting the ground work leading to the development of the pulse-resolving direction finder are reported. A four-stage amplifier incorporating a high degree of inverse feed-back has been considered as the basic design for the voltage amplifier section of the improved direction finder. It appears that a bandwidth of less than 100 kc/sec. may provide adequate speed-of-response characteristics if the gain requirements do not prove severe. See also TIP U8451 (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3067. ANONYMOUS, "D/F Signal to Noise Improvement Unit," Crystal Research Labs., Inc., Interim Engineering Report, TIP No. R3070; 22 July-22 October 1949. ABSTRACT: Experiments were conducted using a single short delay line regenerative loop fed by a sine-wave modulated carrier. A shift in loop frequency occurred due to the combination of RC time constants. The phase shift which was caused by the IF transformers in the receiver was minimized by putting an RC phase shifter in 1 of the loops so that it would conform with the phase shift of the other loop at its frequency, HF noise was removed when a third loop was added, but the amount of enhancement was not increased appreciably and a noise signal of lower frequency persisted. The problems encountered and the corrective methods used are evaluated. This preliminary work was expanded to the use of a complex wave form and a long delay line which more closely simulates the actual operating conditions of the equipment. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3037)

3068. ARMSTRONG, H. L., AND WALLER, J. R., "Earth Mat for the Cathode Ray Direction Finder Antenna," National Research Council of Canada, Radio and Electrical Engineering Division. See Department of Commerce PB99685; October 1949. ABSTRACT: Use of an earth mat of limited size to approximate the ideal of an infinite conducting plane for an Adcock antenna installation. A method is described for measuring the impedance of radial wires at the edge of the mat, and thus choosing suitable combinations of lengths to offer a low impedance over a wide band. NRCC 2016. NRCC ERB-232. (a-3, b-3, c-1, d-7, e-0, f-Description)

3069. BODEZ, P., "Rotating Aerial for an Automatic Radiogoniometer," Ann. Telecommun., vol. 4, pp. 341-346; October 1949. ABSTRACT NO. 1: Theory and principle of operation of a system comprising three vertical $\lambda/4$ dipoles asymmetrically spaced at the corners of a horizontal triangle and turning together on a vertical axis. A field-strength pattern with a single sharp minimum is obtained. An experimental model operating on 120 Mc gave satisfactory results. Sensitivity is about the same as with Adcock systems. ABSTRACT NO. 2: Rotating antennas for automatic radio direction finder; new system proposed having three asymmetrical antennas; diagram directly obtained showing zero or minimum direction of radiation; precision obtained similar to that of classical Adcock system; data on band pass characteristics and sensitivity. (a_1-6, a_2-3, b-1, c-3, d-3, e-0, f-Theory)

3070. CHANDLER, C. W., "Analysis and Measurement of Elliptically Polarized Electromagnetic Waves," Ohio State University Research Foundation, Columbus, Ohio. See Department of Commerce PB103481; October 1949. ABSTRACT: A study to analyse the properties of elliptical polarization and to determine the means of measuring these properties is presented. The analysis shows that the resultant electric intensity vector of the n waves of the same frequency intersecting at a point in space, describes an ellipse in a plane passing through the point. A determination of the space pattern of an elliptically polarized antenna system can be obtained from six patterns all of which may be recorded continuously, while the antenna under test is being rotated. The general procedure is provided for the determination of rotation by phase measurements. Contract W33-038-ac-16520. Project report 301-18. (a-3, b-3, c-1, d-1, e-0, f-Study)

3071. SMEBY, L. C., "Short-Antenna Characteristics - Theoretical," Proc. IRE, vol. 37, pp. 1185-1194; October 1949. ABSTRACT: A mathematical analysis of experimental data obtained by Smith and Johnson for antennas with umbrella top-loading. The theory developed agrees satisfactorily with the experimental results. For single-tower operation, the horizontally polarized radiation is negligible. With the optimum length of umbrella, the vertical radiation characteristic is the same as it would be from the radiator without top loading. The method of analysis can be extended to other kinds of top loading. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3072. BENNISON, G. K., "Universal Search Radar Direction Finders AN/GRA-7 and MX-536/GRD," Air Materiel Command, Watson Laboratories, Memo Report No. ENRCF-1-2; TIP No. U10892; 14 October 1949. ABSTRACT: The uses of 2 direction finders and the flexibility of their components were studied. The MX-563/GRD formed an instantaneous D/F equipment covering the 3- to 9- and 100- to 156-mc. bands. Radio signals are received by the antenna, converted to suitable wave forms, and tuned by the comparator. The output is fed to the PPI scope. The disadvantage of this system is the time delay in obtaining the bearing. The AN/GRA-7 which was developed to overcome this defect employs a filter to replace the comparator. The indicator compares the phase relationship of the D/F signal voltage with the reference and produces a strobe line showing the bearing of the signal. The MX-536/GRD will be used with existing equipment where the changes to the PPI would outweigh the benefits of instant display. The AN/GRA-7 was recommended for use with new development of search radar equipment. (a-3, b-3, c-1, d-1, e-0, f-Description)

3073. BROWN, C. R., "Circularly Polarized DF Antennas," Federal Telecommunications Laboratories, Nutley, New Jersey, Progress Report No. 5, Contract No. W36-039-sc-36850; TIP No. U8185; November 1949. ABSTRACT: Operation of a full-scale circularly polarized, balanced helix, directional pair for 50 to 160 mc. with a modified feed system was good above 100 mc., but at lower frequencies pick up of the horizontal members of the supporting structure was not eliminated. It is believed that difficulties develop because the antenna becomes less efficient as its size in terms of wave length decreases at the lower end of the frequency band. A larger scale model to operate from 50 to 100 mc is being made. A recheck of the impedance from 90 to 160 kc showed a somewhat better VSWR than that with the original feed system. Azimuth patterns at 110 and 150 mc had the same shape regardless of polarization, and the nulls were accurately superimposed. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3074. HIRSCH, C. J., "Pulse-Multiplex System for Distance-Measuring Equipment (DME)," Proc. IRE, vol. 37, pp. 1236-1242; November 1949. ABSTRACT: Distance from a ground transponder beacon is determined by measuring the time interval between sending an interrogator pulse and receiving the reply. Traffic among several beacons with overlapping service areas can be handled by frequency and pulse-pair coding arrangements so that each signal consists of a pulse pair of distinctive spacing, of the order of 10/25µs. Circuits are described which recognize signals having only one such spacing. The equipment described is for 52 channels, but the same method could be used for 100 chanels. (a-3, b-1, c-1, d-1, e-0, f-Description)

3075. LIBBY, R. L., "The Principles and Characteristics of an Instantaneous VHF Direction Finder," NRL Report 3572; November 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3076. MARSHALL, J. G., "Two-Band Antenna-Matching Networks," QST, vol. 33, pp. 14-18 and 48-51, 114; October and November 1949. ABSTRACT: All practical cases of antennas working on two harmonically related amateur bands are discussed, with straightforward design formulas. (a-3, b-1, c-1, d-1, e-0, f-Antenna design)

3077. DAVIS, S., AND KENYON, P. B., "Radio Set AN/CRD-1 (XE-3)," U.S. Camp Evans Signal Laboratories, Belmar, New Jersey, See Department of Commerce PB103585; TIP No. U8099; 15 November 1949. ABSTRACT: Radio set AN/CRD-1(XE-3), an ultra-high frequency, lightweight, air-transportable, automatic-tracking, meteorological direction finder, was tested to determine its characteristics and conformance with requirements. A general description is given of the equipment, and test procedures and results are outlined. With a few modifications, the equipment, when used to track radiosonde AN/AMT-4, will satisfactorily supply accurate wind-speed, wind-direction, temperature, pressure, and humidity data. Angular tracking accuracies of better than 0.07° in both azimuth and elevation have been obtained consistently, and attainment of adequate performance can be expected at temperatures of about -40°. Dept. of the Army Project: 3-25-08-031. Signal Corps Project: 923E. SCEL ER E-1050. (a-3, b-3, c-1, d-1, e-0, f-Description)

3078. BURGMANN, V. D., AND SHERIDAN, K. V., "Microwave Direction Finding for Aircraft Navigation," Commonwealth Scientific and Industrial Research Organization (Australia), TIP No. U16607; 22 November 1949. ABSTRACT: Not available. See Jnl. of the Institute of Navigation (London), vol. 3, pp. 251-269; July 1950, which is original paper. (a-4, b-1, c-1, d-5, e-0, f-0)

3079. SHEFTER, S. S., "Rawin Set AN/GMD-1," Signal Corps Engineering Laboratories, Evans, Test Report No. T-1226; TIP No. U10285; 30 November 1949. ABSTRACT: Performance tests showed that Rawin set AN/GMD-1 was superior to existing meteorological direction-finding equipment radio set SCR-658. The principal advantages were (1) automatic tracking, (2) more accurate angular tracking down to approximately 5° of elevation and sharper antenna lobes for greater tracking accuracy, and (3) greater ranges. Correction of deficiencies noted during the tests should result in more efficient equipment. (a-3, b-3, c-1, d-1, e-0, f-Test report)

3080. BOUDOURIS, G., "Radiation Patterns and Gain of a Four-Antenna Array Located at the Corners of a Square around a Central Parasitic Antenna," J. Brit. IRE, vol. 9, pp. 427-439; December 1949. ABSTRACT: An array of 4 driven aerials, located at the corners of a square, around a central parasitic aerial, is analysed. All aerials are taken to be $\lambda/4$ long and grounded to a perfectly conducting plane. It can be easily proved that, with the aerials $< \lambda/4$ long, grounded to an imperfectly conducting earth, the shape of the radiation patterns and the field strength gain remain practically unaffected because the field strength is then reduced uniformly in the same ratio. The procedure followed is, first, to calculate the total impedance at the base of each aerial as a function of the aerial diagonal spacing. This spacing is the fundamental variable used in all subsequent calculations. Next, the ratio of the parasitic aerial induction current to the current fed into each of the 4 driven aerials is determined. An equation is obtained, giving the field strength produced at an arbitrary point in space. This equation gives immediately the horizontal and vertical radiation patterns in terms of the diagonal spacing of the array. Under certain conditions it exhibits pronounced directive characteristics. Finally, a formula giving the rms field strength in the horizontal plane is obtained. This formula is transformed later in order to give the rms field strength which is produced from the total power fed into the array. The same total power fed into a single aerial of the same design produces a different horizontal field. Comparing the two fields produced by the array and the single aerials respectively, a relation giving the average field strength gain is obtained. (a-3, b-1, c-1, d-5, e-0, f-Description)

3081. BRIZA, J., "Rotatable Directive Antenna," Tesla Tech. Rep (Prague), pp. 10-32; December 1949. ABSTRACT NO. 1: The apex of a rhombic antenna is attached by means of insulators to the rotatable head of a wooden mast, the other three junctions being attached by sectioned cables to carriages running on a circular track round the mast. The positions of the carriages, which form a symmetrical system, are controlled to alter the direction of transmission or reception and also to adjust the apex angle to suit different frequencies. The antenna is fed at its lowest point by twin cable which is carried round with it. Computed polar diagrams are compared with experimental results for scale models. ABSTRACT NO. 2: Short-wave directional aerials are reviewed and a new rotatable directional aerial is described in detail. It is basically a sloping rhombic aerial, suspended on a single mast so that it can be rotated and attached to 3 cars which in turn run on rails around the mast; shifting the cars controls 3 parameters: direction of transmission or reception; apex angle of the rhombus, the angle between the plane of the aerial and the ground plane. This permits favourable horizontal and vertical transmitting and receiving directional patterns for each frequency used and with respect to the electrical properties of the ground: the effectiveness of the aerial is improved; its frequency range is increased and its dimensions are reduced. Lower investment costs are involved for installation of an aerial for transmission or reception in various directions and on various frequencies. Description and results are given of measurement of the azimuthal and vertical radiation pattern on a scale model of the aerial. (a_1-3, a_2-3, b-1, c-19, d-19, e-0, f-Description)

3082. BROWN, C. R., "Circularly Polarized DF Antennas," Federal Telecommunications Laboratories, Nutley, New Jersey, Final Report, Project No. W36-039-sc-36850; TIP No. U10523; December 1949. ABSTRACT: Experimental investigations were conducted on 1000-mc. models of 3 types of antennas: the loop and dipole, the tilted element loop, and the broadside or omnidirectional helix. The omnidirection balanced helix was selected as the best system for use in a directional pair. A directional pair of balanced helixes was designed for 50- to 160-mc. operation centered on 100 mc. This system operated satisfactorily from 100 to 160 mc. Below 100 mc., the pattern of the horizontally polarized component was distorted by energy picked up by metallic horizontal members in the supporting structure. Attempts to eliminate the distortion were unsuccessful. Therefore a second larger system was designed which operated satisfactorily from 50 to 100 mc. (a-3, b-3, c-1, d-1, e-0, f-Project survey)

3083. BROWN, J., "Gain of Aerial Systems," Wireless Eng., vol. 26, pp. 409-410; December 1949. ABSTRACT: When an aperture of given size is used as an end-fire radiator instead of as a broadside radiator, only the normal increase in gain is realized which occurs when a radiator is situated at the surface of a perfect reflector. This increase is less than that predicted by Bell, because the field strength near the plane of the aperture is not zero, at any rate in the direction of the beam. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

3084. EVERHART, A. G., "Direction Finding Kit Mx-536/GRD and GRA-7," Federal Telecommunications Laboratories, Nutley, New Jersey, Progress Report No. 12, Contract No. W33-038-ac-21373, TIP No. U11111; December 1949. ABSTRACT: Preliminary test results on the VHF receiver, power supply, filter unit, and target transmitter were satisfactory. Chamber tests of the oscillator tank circuit indicated that the drop from +25° to -18°C changed the frequency of the crystal by 230 kc. It is planned to change the oscillator material. New wrap-around for the HF receiver and power supply permitted integral testing of these units with other equipment. Recommendations were made for hermetic sealing of the HF goniometer and drive motor during inclement weather operation. (a-3, b-3, c-1, d-1, e-0, f-Progress report See Abstract No. 3030)

3085. JORDON, E. C., "A Comparison of Radio Direction Finding Systems," University of Illinois, Radio Direction Finding Research Laboratory, Technical Report No. 9; 1 December 1949. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-200, f-0)

3086. KOVARA, E. J., AND OVERTON, B. H., "Engineering Development and Operational Suitability Test of Radio Direction Finder Assembly AN/CRD-6," Air Proving Ground, Final Report, Project No. 7496----5; TIP No. R3163; 5 December 1949. ABSTRACT: The AN/CRD-6 is an air-transportable radio receiver and direction indicating system which may be used on UHF channels in the 225- to 400-mc. spectrum. It is designed for use as a temporary or fixed, ground, radio direction finder (D/F) in conjunction with airborne UHF radio sets AN/ARC-19 or AN/ARC-33. The system comprises a mast with D/F antenna assembly, radio receiving equipment, bearing indicator, target transmitter, and power unit. An air-transportable shelter and a remote and local control unit are provided. A diversity D/F antenna devised to overcome operational difficulties due to interference fading consisted of 2 standard AS-449/GRD antennas, 1 at a 20-ft. level, and the other at 27 ft. The tests showed that the radio D/F assembly AN/CRD-6 was satisfactory for interim use by USAF. Modified indicator damping was an improvement over standard damping and should be incorporated into any interim equipment. Bearing accuracy was not completely satisfactory; diversity operation would reduce field operational inaccuracies. Field test and orientation equipment for use with the AN/CRD-6 was inadequate. Precipitation reduced the range and bearing accuracy of UHF signals. (a-3, b-3, c-1, d-1, e-0, f-Survey and evaluation)

3087. SILBERSTEIN, R., "Radio Propagation Effects on High Frequency Direction Finders, Phase I-- Experimental and Phase II-- Literature Survey," National Bureau of Standards, Quarterly Report Nos. 11 and 12; 1 July - 30 December 1949; TIP No. U10450; ca 31 December 1949. ABSTRACT: Mutual impedance between antennas was the major cause of errors in relative phase readings on pairs of collectors in ground-target calibrations on vertical polarization at Sterling. This indicated another source of errors in standard direction finders and others using similar antenna arrays. Use of tuned input circuits made the mutual impedance errors as small as those due to vertical wires not connected to ground and much shorter than 0.25 wave length. Phase errors observed in the 4-aerial, 2-channel phase comparison system were an order of magnitude larger than those calculated from theory. The modified walkie-talkie receiver for measuring ground constants was rebuilt to obtain greater sensitivity and ease of operation. (a-3, b-3, c-1, d-1, e-0, f-Study report)

1950

3088. ANONYMOUS, "Report of the Radio Research Board for the Period 1st October 1933 to 31st December 1948, with a Survey of the Investigations Carried Out during the Years 1934-1947, and Report of the Director of Radio Research for the Year Ended 31st December, 1948," Great Britain Department of Scientific and Industrial Research, Radio Research Board. See Department of Commerce PB102777; 1950.

ABSTRACT: 72 Pages of photos and text within the report, which is available as a Department of Commerce publication or from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. (address as of 1950). (a-4, b-3, c-1, d-5, e-0, f-Survey)

3089. CARBENAY, F., "Extension to Atmospheric Radio Direction Finders of the Definition of the Threshold of Action by an Impulse Flux," U.R.S.I. Proc. IXth Gen. Assembl., vol. 8, pp. 329-331, Pt. II; 1950. ABSTRACT: Earlier work defining the threshold of action of an automatic receiver for recording the mean level of atmospherics by an impulse flux is extended to the case of radio direction finders of atmospherics. (a-3, b-1, c-8, d-15, e-0, f-Theory)

3090. HAWKINS, J. E., "Recent Lorac Developments," Proc. NEC Chicago, vol. 6, pp. 318-226; 1950. ABSTRACT: Description of a new method of radio surveying which has been tested experimentally in the Gulf of Mexico area, using frequencies near 1,772 and 1,798 kc. Intersecting hyperbolic interference patterns are produced by the radiations from the two pairs of transmitters; "fixes" are obtained directly from the readings of two phase meters in the mobile receiver. (a-3, b-1, c-1, d-1, e-0, f-Survey)

3091. HORNER, F., "The Accuracy of the Location of Thunderstorms by Cathode Ray Direction Finders," U.R.S.I. Proc. IXth Gen. Assembl., vol. 8, pp. 346-350, Pt. II; 1950. ABSTRACT: Examination of the data from the British network of stations operating on 12 kc/s shows the presence of systematic (non-observational) errors of direction up to 10° at each station, in addition to random errors (with standard deviation = 2°). Irregularities of the sites are suggested as possible causes of the systematic errors. (a-3, b-1, c-8, d-15, e-0, f-Discussion)

3092. JOACHIM, M., "Theory of the Double-Frame Radiogoniometer," Radio Applications, Cas. Pest. Mat. Fis., vol. 75, pp. D63-D79; 1950. ABSTRACT: In considering the characteristics of the double-frame goniometer, the author deals both with the effects of the polarization of the direct wave, and with the wave reflected on soils of various conductivities. It is shown that with the ideal instrument, two minima should be obtained, with zero polarisation error. The secondary or auxiliary minima (again two) are affected by the same error as would occur with a single-frame goniometer. When the absolute conductivity of the ground is considered, two auxiliary minima, separated by an angle δ, are obtained. In this case the value of the error is not a function of the height above ground of the frame. The 4 minima are all sharp. The principal maxima are greater, the auxiliary ones smaller in the case of the co-planar goniometer, which means that the coaxial instrument is more accurate. Above a ground of non-homogeneous composition, the error of the principal minima remains always zero and the minima are sharp, but the position of the auxiliary minima is a function of the characteristics of the ground and the height above ground of the frame. The effects of the characteristics of the ground are tabulated. The practical results confirm the theory. (a-3, b-1, c-19, d-19, e-0, f-Study)

3093. KNUDSEN, H. L., "The Field Radiated by Circular and Square Helical Beam Antennas," Trans. Dan. Acad. Tech. Sci., no. 8; 1950. ABSTRACT: Theoretical investigations, as well as measurements, have shown that the current distribution on a helical antenna radiating in the axial mode may be described, for the greater part of the helix, as a progressive current wave with constant amplitude and phase velocity, moving along the wire away from the feed point. Formulas for the em field, radiated from an arbitrary current distribution, are reviewed and applied to the calculation of the field radiated by a circular helical antenna. The field is expressed in the form of rapidly converging series. The general formulas are used to derive the field of a helix with an integral number of turns, and a numerical example is worked out. Corresponding calculations are made for a square helical antenna, the field components being obtained as closed expressions from which approximate formulas for the circular-helical antenna are derived. The series obtained for the circular helix are, however, so rapidly convergent and the closed expressions for the square helix are so simple that approximate formulas are hardly necessary. (a-1, b-1, c-8, d-20, e-0, f-Theoretical analysis)

3094. KOJAN, J. S., "First Ionospheric Storm Warning Service," Marconi Revue, vol. 13, no. 97, pp. 53-71; 1950. ABSTRACT: Nature of ionosphere and ionospheric transmission; analysis of effects produced on h-f communication and h-f direction finding by ionospheric disturbances; review of early attempts at forecasting disturbances; improvement in forecasting after formation of Inter-Services Ionosphere Bureau in 1941; later developments and future storm warning services. (a-3, b-1, c-1, d-5, e-0, f-Description)

3095. KRAUS, J. D., Antennas, McGraw-Hill Book Co., New York, N. Y.; 1950 ABSTRACT: It is the purpose of this book to present the basic theory of antennas with emphasis on their engineering applications. An effort has been made to give a unified treatment of antennas from the electromagnetic theory point of view while keeping in mind the aspects of engineering importance. The principles given are basic and are applied to antennas for all frequencies. The first four chapters deal with the fundamental theory of point sources and of the antenna as an aperture. These are followed by three chapters on linear, loop, and helical antennas in that order. The theories of the biconical antenna and of the cylindrical antenna are then discussed. The self and mutual impedance of antennas and the theory of arrays of linear antennas are taken up in the next chapters, and these are followed by chapters on reflector-type antennas, slot, horn, complementary, lens, long wire antennas, and many other types. The final chapter describes methods and techniques of antenna measurements and includes a discussion of wave polarisation. The Appendix has a number of useful tables for reference. (a-1, b-6, c-1, d-1, e-0, f-Reference book)

3096. MORISON, S. E., The Rising Sun in the Pacific, History of United States Naval Operations in World War II, vol. III, Little, Brown and Company, Boston; 1950. ABSTRACT: This reference mentions an example of ambiguity error in the interpretation of a direction finder bearing on a communications transmission from a Japanese aircraft carrier. On page 215, the author states "The next mistake was a false interpretation of a direction-finder bearing on a radio transmission from a Japanese carrier. These instruments record simultaneously reciprocal bearings--both the direction toward and the direction away from the object. One has to estimate which is correct. In this instance the enemy carrier bore 358° or almost due north from Pearl Harbor; but the interpreter made it 178° or almost due south. To add to the confusion, one of Admiral Halsey's aviators identified Rear Admiral Draemel's light cruisers and destroyers which had sortied from Pearl Harbor to join him, as an enemy force." The use of direction finding bearings is mentioned again on pages 215 and 216. (a-4, b-6, c-1, d-1, e-0, f-Incident related to D/F interpretation error)

3097. WEBB, H. D., "Selecting Critical Components for Matched-Channel Radio Receiving Systems," Proc. NEC (Chicago), vol. 6, pp. 206-217; 1950. ABSTRACT: In some D/F systems receivers are necessary with two or more channels matched in phase and gain characteristics. Matching may be made less critical by using wide-band IF amplifiers having selective filters, or wide-band rf amplifiers with suitably selected bandwidths, or a combination of the two. Selective grading and matching is proposed as an economical means of providing component with the close tolerances requisite for such receivers. (a-3, b-1, c-1, d-1, e-0, f-Specifications)

3098. WISE, W. H., "Capacity of a Pair of Insulated Wires," Quart. Appl. Math., vol. 7, pp. 432-436; January 1950. ABSTRACT NO. 1: A method of calculating capacitance is given. Certain analytical difficulties which arise when the insulating jackets are in contact are indicated. ABSTRACT NO. 2: This problem has been treated in elegant fashion by Craggs and Tranter. Their first two papers employ a conformal transformation of the free space; the third paper works with charge distributions. They end up with an infinite determinant of value zero in which the unknown capacity appears in one element, and conclude that "satisfactory numerical approximations can be obtained by keeping only the first few rows and columns." (a_1-3, a_2-1, b-1, c-1, d-1, e-806, f-Analysis)

3099. ANONYMOUS, "Electronic Aids to Air Navigation," Electronics, vol. 23, no. 2, pp. 66-71; February 1950. ABSTRACT: Equipment whereby scheduled aircraft movements without regard to weather conditions will be made possible; systems under development in Radio Tech Committee for Aeronautics Transition Program; data on compass systems, direction finders, radio ranges, omnidirectional systems, approach control and landing systems and markers. (a-3, b-2, c-1, d-1, e-0, f-Description)

3100. GULLNER, G., "Aerials Protected from Effects of Local Fields," Arch. Elec. (Ubertragung), vol. 4, pp. 71-75; February 1950. ABSTRACT: Two compensation arrangements are described which greatly reduce the interference from electrical machines or other possible sources of rf radiation near a receiving antenna. (a-5, b-1, c-4, d-4, e-0, f-Description)

3101. HARRIMAN, M. W., AND WILLIAMS, S. B., "Visibility on Cathode-Ray Tube Screens: Positive vs Negative Signals on an Intensity Modulated Scope," Jour. Opt. Soc. Amer., vol. 40, pp. 102-104; February 1950. ABSTRACT: This paper compares two methods of presenting targets on radar crt screens. One method uses grid targets (positive signals) which appear brighter than their background, and the other cathode targets (negative signals) which appear darker than their background. Data were collected from 3 subjects on a very small target and on one of moderate size. A third target, intermediate in area, was studied, but in less detail. The results show: (1) the visibility of a cathode target is better than that of a grid target at bias levels which are relatively bright. The amount by which cathode targets are more visible is 1-9 db. (2) There is evidence that the dimmest bias at which the cathode target is superior to the grid target is a function of the size of the target. (3) The optimal bias for a very small target is shifted to a brighter level by ~ 1-1/2 V when target voltage is injected at the cathode. (4) The superiority of the cathode target is due to a property of the phosphor which allows it to work on a portion of its response curve favourable to human vision. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3102. KING, R., "The Theory of N Coupled Parallel Antennas," Jour. Appl. Phys., vol. 21, pp. 94-103; February 1950. ABSTRACT: The integral-equation theory of coupled antennas developed by King and Harrison, Tai, and Bouwkamp is generalized to apply to any number of units arranged symmetrically in a circle. The case of four antennas at the corners of a square is discussed in detail. Application to cage and corner-reflector antennas is indicated. The driving voltages required to maintain specific currents in N parallel antennas arranged in line are determined; the currents corresponding to specified voltages can only be found by solving simultaneous integral equations, but an approximate analysis is given for the special case of λ/2 dipoles. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3103. LONGMAN, E. R., AND AWRAMIK, JR., J., "Directive Communication System with Mutually Aligning Antennas," NRL Report 3627; February 1950. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3104. LUNDBURG, F. J., AND BUCHER, F. X., "Antenna System for Very-High-Frequency Radio Ranges and Direction Finding," 1950 IRE National Convention Program, Proc. IRE, vol. 38, pp. 192-211; February 1950. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-Description)

3105. MARSHALL, J. G., "Two-Band Antenna-Matching Networks," QST, vol. 34, pp. 36-39, 90; February 1950. ABSTRACT: To demonstrate the use of the design formulas previously given, numerical examples are calculated for a simple antenna operating on its fundamental and second-harmonic frequencies, using different types of transmission line. (a-3, b-1, c-1, d-1, e-0, f-Mathematical analysis)

3106. MOULLIN, E. B., Radio Aerials, Oxford University Press, London. See also Wireless World, vol. 56, p. 70; February 1950. ABSTRACT: The first section of the book is theoretical. The Lorentz vector and scalar retarded potential functions are first established and then applied to specific problems. These include the fields due to filaments, the effect of flat-sheet and V-shaped reflectors, and problems relating to cylinders immersed in electromagnetic fields. Some hypothetical problems are solved rigorously, usually in terms of Bessel functions, and practical problems are considered as approximations - usually very close ones - to the hypothetical cases. The power gain of typical arrays with various current distributions is calculated, and methods of suppressing the side-lobes discussed. A short section is devoted to the isolated antenna. The remaining one-third of the book describes experimental procedure, and the results of measurements made on some of the antennas described in the first section. Results for V antennas are given in great detail, and include the radiation patterns for various V angles and sizes of sheet. Attention is drawn to many practical design considerations, such as the permissible tolerance on reflector shape, the use of netting and rods instead of continuous sheet, and similar problems. The treatment is mainly mathematical and the book will therefore appeal more to the antenna specialist or post-graduate student. It will be found valuable not only as a book of reference on the types of antenna covered, but also for the clear and logical development of the general theory. (a-1 and 5, b-6, c-1, d-5, e-0, f-Reference book)

3107. PRESSEY, B. G., AND ASHWELL, G. E., "Fixed H-Adcock Direction Finder for VHF," Wireless Eng., vol. 27, pp. 54-58; 1950. ABSTRACT NO. 1: The paper describes an investigation into the practicability of the fixed type of H-Adcock direction finder for use at very high frequencies (30-100 Mc) under conditions in which the antenna system is remote from the operator. The experimental equipment consisted essentially of two crossed H-Adcock antennas mounted on a wooden tower 10 m high. The antenna system was connected by R.F. transmission lines to a goniometer and receiver situated in a hut near the base of the tower. By making adjustments to the length of the transmission lines and their point of connection to the antenna feeders, a high instrumental accuracy was obtained on signals of mixed as well as vertical polarization. The sensitivity was such that bearings with a silent swing of ± 5° could be taken on field strengths varying between 0.5 and 14 μv/m over the frequency range. ABSTRACT NO. 2: Study of antenna system being practicability of fixed H-Adcock direction finder for use at 30-100 Mc under conditions in which antenna system is remote from operator; experimental equipment consisted essentially of two crossed H-Adcock antennas mounted on wooden tower 10 m high, connected by transmission lines to goniometer and receiver near base of tower. (a_1-1, a_2-3, b-1, c-1, d-5, e-0, f-Study)

3108. ROSS, W., "The Variations in Direction of Arrival of High-Frequency Radio Waves," Proc. Phys. Soc., vol. 63, no. 362B, pp. 149-150; 1 February 1950. ABSTRACT: Summary of Physical Society Summer Conference paper. Bearings observed on hf transmissions are subject to continuous fluctuations, apart from those due to variable instrument errors. Both rapid and slow fluctuations occur, the latter with periods from a few minutes up to half an hour. These slow fluctuations are similar for bearings on neighbouring frequencies and transmission paths: they are apparently due to fairly localised tilting of the ionosphere layers. The rapid fluctuations are observed even when pulses are used, and hence may be caused by ionosphere irregularities of smaller scale than those causing slow fluctuations. The random irregularities may be due to the spreading of disturbances produced by perturbations in the regular diurnal changes in the ionosphere. (a-3, b-1, c-1, d-5, e-0, f-Study report)

3109. SMITH, S. B., AND TREMELLEN, K. W., "Very-Low-Frequency Propagation," Proc. Phys. Soc., vol. 63, p. 143; 1 February 1950. ABSTRACT: Short summary of Physical Society Summer Conference paper. Earlier experiments during 1920-26 are discussed, with particular reference to (a) apparent abnormalities and other little known phenomena, (b) world atmospheric noise centers, seasonal, and diurnal variations in direction and intensity, and (c) D/F using different techniques, with special reference to reception along various geomagnetic paths. (a-3, b-1, c-1, d-5, e-0, f-Propagation study)

3110. ANDERSON, S. R., AND KEARY, H. F., "Polarization Errors of Two Different Omnirange Antenna Arrays," U. S. Civ. Aeronautics Administration - Tech Development Report, no. 63; March 1950. ABSTRACT: Flight tests on Youngstown, Ohio, and Indianapolis, Ind., v-h-f omniranges. Youngstown omnirange antenna array comprised of single loop and two pairs of crossed dipoles; Indianapolis omnirange utilizes standard 5-loop antenna array. (a-3, b-3, c-1, d-1, e-0, f-Description)

3111. LEPAGE, W. R., AND HARRINGTON, R. F., "A Study of Directional Antenna Systems for Radio D/F Purposes," Institute of Industrial Research, Syracuse U., Progress rept. no. 7, 15 December 1949-15 March 1950, TIP No. U11817. ABSTRACT: An experimental set up was constructed simulating the situation of elements in an array. Impedance was not measured because of inaccuracies in the equipment. Three tapered matching sections were constructed; tentative measurements indicated satisfactory performance. The treatment of the Wullenwever is complete, but the formulas for the field patterns are unwieldy when the granularity effects of the discrete elements are included. The patterns can be computed by a direct summation of the contributions of the individual elements. Since the direct summation is tedious, a usable formula employing tabulated functions is desirable. A solution is given expressing the result as a trigonometric series which is most useful when the array diameter is small. A design of a prototype commutator which will commutate adjacent elements is almost complete. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract Nos. 2967 and 3130)

3112. ROSS, W., "The Specification and Measurement of Polarisation Errors in Adcock-Type Direction Finders; Elektrotechnik (Berlin), vol. 4, pp. 90-92; March 1950. ABSTRACT: This is a German Language Abstract of original article. See Proc. IEE, pp. 269-277; July 1949. (a-4, b-1, c-4, d-5, e-230, f-See Abstract No. 3044)

3113. BODE, H. W., AND SHANNON, C. E., "A Simplified Derivation of Linear Least Square Smoothing and Prediction Theory," Proc. IRE, vol. 38, pp. 417-425; April 1950. ABSTRACT: The central results of the Wiener-Kolmogoroff smoothing and prediction theory for stationary time series are developed by a new method. The approach is motivated by physical considerations based on electric circuit theory and does not involve integral equations or the autocorrelation function. The cases treated are the "infinite lag" smoothing problem, the case of pure prediction (without noise), and the general smoothing prediction problem. Finally, the basic assumptions of the theory are discussed in order to clarify the question of when the theory will be appropriate, and to avoid possible misapplication. In a classic report written for the National Defense Research Council, Wiener has developed a mathematical theory of smoothing and prediction of considerable importance in communication theory. A similar theory was independently developed by Kolmogoroff at about the same time. Unfortunately the work of Kolmogoroff and Wiener involves some rather formidable mathematics - Wiener's yellow-bound report soon came to be known among bewildered engineers as "The Yellow Peril" - and this has prevented the wide circulation and use that the theory deserves. In this paper the chief results of smoothing theory will be developed by a new method which, while not as rigorous or general as the methods of Wiener and Kolmogoroff, has the advantage of greater simplicity, particularly for readers with a background of electric circuit theory. The mathematical steps in the present derivation have, for the most part, a direct physical interpretation, which enables one to see intuitively what the mathematics is doing. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3114. RABIER, J., "Principles of Certain Systems of Radio Navigation; Study of Particular Case: Raydist," Annales des Télécommunications, vol. 5, no. 4, pp. 137-142; April 1950. ABSTRACT: Survey of systems based on propagation velocity of electromagnetic waves; comparison of single and double path systems; utilization of Doppler effect; advantages and disadvantages of Raydist. Bibliography (a-3, b-1, c-3, d-3, e-0, f-Survey)

3115. LAGRONE, A. H., "Graphical Solution of the Angle - of - Arrival Equation for Two Wave Components," Electrical Engineering Research Laboratory, Univ. of Texas, Memo. No. 11; 1 April 1950. ABSTRACT: In Electrical Engineering Research Laboratory Report No. 13(1), a solution was given to the problem of determining the angle-of-arrival of each of two plane waves of identical frequency arriving simultaneously at a receiver. This solution was extended to two spherical waves in Memo No. 5(2). In both cases the solution involved considerable mathematical maneuvering after the measured data had been obtained. This paper presents a method whereby the same data, treated differently, yields the solution in graphical form with the final answer being obtained by the simple addition or subtraction of three angles. (a-1, b-3, c-1, d-1, e-396, f-Wave interference analysis)

3116. RALEIGH, J. H., "Design of Receiver Antenna Systems Considering Noise Limitations," U. S. Navy Electronics Laboratory, San Diego, California, Report 166; 4 April 1950. ABSTRACT: An antenna which is long enough at minimum atmospheric noise levels will be longer than necessary at higher noise levels... A 5-foot tuned antenna is satisfactory 100 per cent of the time (a) over the 0.5-to-30 Mc band, for a nominal field intensity of 1 microvolt per meter, and (b) over the 15-kc to 30-Mc band, for a field intensity of 6 microvolts per meter. (Its length is sufficient 75 per cent of the time under average noise conditions regardless of signals level.) In a system of fixed-tuned antennas shorter than a quarter wave, antenna length and operating bandwidth should be made to increase together. An octave system consisting of a group of six antennas, fixed-tuned at the base and 11 to 25 feet long, to cover the 0.5-to-30 Mc range, is comparable in efficiency with a group of 5-foot antennas continuously tuned. Groups of receivers to be multiplexed by means of either active or passive networks have similar antenna requirements. (a-1, b-3, c-1, d-1, e-218, f-Description)

3117. GRUBER, J. R., "A Submarine Direction Finder for Radar Intercept. The AN/BPA-1 (XN-1)," NRL Report 3666; May 1950. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

3118. PROCTOR, R. F., "Input Impedance of Horizontal Dipole Aerials at Low Heights above the Ground," Proc. IEE, Part III, vol. 97, no. 47, pp. 188-190; May 1950. ABSTRACT: The large increase in the radiation resistance of a horizontal dipole at low heights above the ground, predicted by the mathematical analysis of Sommerfeld and Renner, is confirmed by actual measurement for the case of an essentially-pure-dielectric ground. Measurements carried out above a series of conducting mats of increasing mesh size corroborate the supposition that the large increase in the radiation resistance at low heights is caused by a corresponding increase in the energy radiated downwards into the dielectric ground. (a-1, b-1, c-1, d-5, e-489, f-Analysis)

3119. STARKEY, B. J., AND FITCH, E., "Mutual Impedance and Self-Impedance of Coupled Parallel Aerials," Proc. IEE (London), vol. 97, pp. 129-137; May 1950. ABSTRACT: Existing formulas for the mutual impedance of parallel antennas are approximate or based on simplifying assumptions. To check these formulas, the authors measured the front/back ratios of the radiation patterns of 2-element arrays, confirming and extending the observations of McPetrie and Saxton (1450 of 1946). The use of "intrinsic impedance," based on a simple transmission-line calculation, for the self-impedance of each antenna resulted in poor agreement between theory and observation. By introducing resistive losses and end-capacitance in the lines, quite good agreement was obtained. (a-3, b-1, c-1, d-5, e-0, f-Theory)

3120. ROUBINE, E., "The Directive Properties of Receiving Aerials," Onde Elec., vol. 30, pp. 259-266; June 1950. Full paper of which an abridged version was given in Compt. Rend. Acad. Sci., vol. 230, pp. 1590-1592; 3 May 1950. ABSTRACT: Distinction is made between the case of rectilinear polarization and the general case of elliptical polarization. A simple fundamental formula is derived expressing the current in a receiving antenna as a function of the incident field, the load, and the radiating properties of the antenna in the direction from which the waves are received. The question of the identity of the directive properties of antennas for transmission and reception is in general not well defined. The directivity for emission is, in fact, controlled by a single characteristic, while for reception this characteristic is altered by the intensity and polarization of the incident field, so that all comparisons of the directive properties necessitate an arbitrary convention in respect of the incident field. When considering gain, this convention is modified. The effect of polarization is discussed by means of an optical analogy. Current formulas for the absorption surface and the effective length of a receiving antenna are generalized. (a-3, b-1, c-3, d-3, e-0, f-Theory)

3121. PHILLIPS, W. E., "Radio Receiver R-323(XW-)/GRD (Experimental Model)," Laboie Labs., Inc., Interim engineering rept. no. 11; April 1950, TIP No. R3300; 10 May 1950. ABSTRACT: The R.F. heads of the VHF and UHF receivers were revised to include a 28-mc output transformer. The sensitivity of the head on the VHF receiver was under 5 μv, and the image ratio was greater than 100,000:1. An automatic tuning system with a tuning time of 6.5 sec was tested. Phase measurements were obtained for the direction finder amplifier. (a-3, b-3, c-1, d-1, e-0, f-Interim progress report. See Abstract No. 3063)

3122. ANONYMOUS, "D/F Signal to Noise Improvement Unit," Crystal Research Labs., Inc., Interim engineering rept., 22 October 1949-22 January 1950, Contract No. AF 28(099)67, TIP No. R3579; June 1953. ABSTRACT: A single loop of the 3-channel enhancer was set up using a 3400-μsec delay line. Square and sine wave voltages at 300 c were mixed with noise and applied to the input of the loop. An S/N improvement of approximately 12 db was obtained. These results were obtained only by extreme care because the system had a tendency to "motor boat" at the LF point. A second loop was added but adjustment was still critical although enhancement was increased. A single channel direct-coupled system was designed and built containing broad-band RF circuits, direct-coupled video circuits, and accurate AGC of the loop. At 5 mc a tuned circuit with a Q of 100 gave a 50-kc bandwidth. The output from the video detector was applied to the modulator input with no intermediate coupling networks. Cathode modulation was used for ease in direct coupling and for greater modulation linearity. The enhancer was tested and although the LF response hump was eliminated, an unstable operating point was introduced. A diode modulator was very linear up to 100% modulation. Greater signal amplitude in the loop and better performance resulted. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3067)

3123. ANONYMOUS, "D/F Signal to Noise Improvement Unit," Crystal Research Labs., Inc., Interim engineering rept. 22 January-22 May 1950, TIP No. R3580; June 1950. ABSTRACT: Further work on the enhancement problem is outlined. A proposal for the linear addition of 6 delayed signals would yield an improvement of 2.64 in the S/N ratio or an 8.44-db enhancement with no regeneration. A small amount of regeneration might multiply the number of additions of signals. Six delay units were selected as a compromise between utility

and bulk, and multichannel operation was chosen for economy. The separation between channels was inadequate, and an AF hash appeared due to the beating of various carriers. An additional separating amplifier was inserted in each channel and the crystal oscillators replaced by a carrier generator. Various methods of obtaining additions by recirculation were tested; a feed-back loop was satisfactory. A model was built containing the following units: RF amplifier, master video, carrier generator, modulator, channel separator, power supply and line terminating amplifier. The performance of the final unit was satisfactory. (a-3, b-3, c-1, d-1, e-0, f-See preceding abstract)

3124. BATEMAN, R., FLORMAN, E. F., AND TAIT, A., "A Source of Error in Radio Phase-Measuring Systems," Proc. IRE, vol. 38, pp. 612-614; June 1950. ABSTRACT NO. 1: When a mobile transmitter was moved between two points over different particular paths around reradiating structures, the measured total phase changes differed by 2πn radians, where n is an integer. If reradiation from a reflector is of the same order of magnitude as the radiation from an antenna, analysis of the resultant field shows that singularities occur and each traverse of a closed path around a point of singularity gives a total phase change of 360°. ABSTRACT NO. 2: Error in radio navigation or distance measuring systems observed during course of field calibration of experimental system designed to measure phase difference of r-f fields as received at two widely spaced antennas; experimental evidence showing effect of certain reradiating structures on accuracy of such phase measurements. (a_1-5, a_2-3, b-1, c-1, d-1, e-0, f-Analysis)

3125. HUFFORD, G. A., "An Analysis of Some Anomalous Properties of Equiphase Contours," Proc. IRE, vol. 38, pp. 614-618; June 1950. ABSTRACT: Further investigation of cases, of importance in radio surveying or navigation systems, where the phase at certain points may be multivalued. (a-3, b-1, c-1, d-1, e-0, f-Study and analysis)

3126. KALES, M. L., AND BOHNERT, J. I., "Elliptically Polarized Waves and Antennas," NRL Report 3686. See also Department of Commerce PB102306; June 1950. ABSTRACT: Various properties of elliptically polarized waves and antennas are investigated by utilizing a complex vector method. Well-known relations derived for linear polarization appear as special cases of more general relations for elliptical polarization. A geometrical representation of complex vectors provides a corresponding geometrical interpretation of many of the results obtained. Elliptically polarized fields are resolved into "orthogonal" elliptically polarized components, of which linear and circular components are special cases. Formulas are obtained relating to the polarization ellipse, the polarization pattern, ellipticity, phase, and sense of polarization. The notions of radiation pattern, gain, beamwidth, and phase are examined. (a-3, b-3, c-1, d-1, e-0, f-Study)

3127. KESSLER, W. J., "Direction Finding and Ranging on Atmospherics," Florida U. Engineering and Industrial Experiment Station, Quarterly progress rept. no. 6; 1 March-1 June 1950, TIP No. U12218. ABSTRACT: Plans were completed for alerting the triangulation network, recently augmented by a third station at Chanute Field, immediately after receiving thunderstorm data from the Jacksonville Weather Bureau station. Examination of all available nighttime wave form records showed that atmospheric wave forms suitable for time interval analysis to determine distance can be expected about 248 nights out of the year and that only about 3.2% of the forms during any observation exhibit multiple ionospheric returns. Results are reported of similar studies on 10 daytime thunderstorms at 200 to about 1100 mi from Gainesville. An alternate amplitude limiter was developed for the sense-brightening channel. Details are presented of the LV and HV power supplies using Se dry-disk rectifiers. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract Nos. 2904 and 3066)

3128. TUCKER, J. W., "Passive Bearing Finder. Report No. 2. Signal-to-Noise Ratio of the F-C Coupled Band-Pass Amplifier," NRL Report 3681; June 1950. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3129. DELIBAN, R., "Balanced Impedance Measuring Techniques," Antenna Lab., U. of Calif. Report No. 167, Contract No. NObsr-39401, TIP No. U12222;June 15, 1950. ABSTRACT: Efforts were directed to the development of an instrument which could rapidly provide direct-reading absolute impedance data on balanced loads and absolute impedance and possible resistance and reactance values on floating loads. (The conventional 3-measurement technique consists of short-circuiting the members of a Δ network 1 at a time, and noting the impedance to ground under each condition. 3 equations are used to calculate the necessary impedance values.) An RF power oscillator, a transformer, and suitably connected meters were included in the balanced absolute-impedance meter which satisfactorily measured impedance between 25 and 6000 Ω over a frequency range of 2-27 mc. The instrument was flexible and adequate for most balanced impedance measurements. Floating impedance measurements could be made at VHF by tuned balun (balancing unit) networks and at LF by broad-band baluns. Unbalanced-balun measurements were superior for floating impedances where reactive and resistive components were desired. The balanced balun was suitable for measuring balanced line-to-line impedances. (a-3, b-3, c-1, d-1, e-0, f-Measurements)

3130. HARRINGTON, R. F., "A Study of Directional Antenna Systems for Radio D/F Purposes," Institute of Industrial Research, Syracuse U., Progress rept. no. 8; 15 March-15 June 1950, TIP No. U14735. ABSTRACT: A theory of phase compensation is presented to correct for phase disturbances of the radiation caused by the presence of the reflector. This compensated phasing is readily incorporated into the existing theoretical solutions for the field of a Wullenwever array. An example of the pattern improvement afforded by such compensation is included. An expression is given for the approximate beam width for a Wullenwever array, excited in a beam-co-phaselike manner with cosine-amplitude excitation. The expression is plotted as a curve of beam width vs array diameter. The Fourier coefficients of the single element functions, used in the Wullenwever solutions, are also considered. A relationship was determined between the coefficients of the 2 functions, $\bar{R}(\theta, \phi-a)$ (the vertical component of the far electric field from a single element and cylindrical reflector, referred to an origin at the element) and $\bar{R}_c(\theta, \phi a)$ (the same, but referred to an origin at the cylinder axis). A theoretical pattern survey was started for Wullenwever arrays of 8 wave lengths at the center frequency. A frequency range of 4 to 1 is to be extensively investigated, with some patterns for a 16 to 1 range. A larger experimental array being constructed will provide a 8 wave length array at the geometric center frequency. Curves are given of the characteristics of the 1/4 wave element working against ground, with and without the presence of a reflector; and of the multiple couplers. A glossary of terms and symbols is included. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract Nos. 2967, 3111, and 3228)

3131. SCHULMAN, J. R., ET AL., "Radio Compass AN/ARN-17 (XA-1)," Melpar, Inc. (AF 33(038)3581), Interim engineering rept. 18 April-17 June 1950, TIP No. U12311, 27 June 1950. ABSTRACT: Operation of each stage of the RF section of the receiver was satisfactory during tests. Performance of the tuning meter of the 900-c tone oscillator and the beat frequency oscillators of the IF strip was acceptable. Requirements as to the gain and skirt selectivity of the strip were met. Further tests of the effects of temperature on the crystal filter response, taken with 115°C final temperature, showed the main effect to be narrowing of the pass band consistent with the fidelity requirements and a very slight decrease of attenuation in the stop band. The final power supply, utilizing the new Mallory Ta electrolytic capacitors designed for use from -60° to 200°C, behaved satisfactorily. The vibrator and final power transformer were still operating after about 250 hrs. (a-3, b-3, c-1, d-1, e-0, f-Report)

3132. SILBERSTEIN, R., "Radio Propagation Effects on High Frequency Direction Finders: Phase I - Experimental; Phase II - Literature Survey," Central Radio Propagation Lab., National Bureau of Standards, Quarterly rept. no. 14; 1 April-30 June 1950, TIP No. U18298. ABSTRACT: Gear was reassembled at the Lexington Field Station of Cruft Laboratory, and tests on a 4-aerial narrow-aperture system were made using a CW target transmitter. Relative phases between the waves arriving from any azimuth at each collector of a pair were measured through twin receiver channels by means of an oscilloscope and a calibrated phase-shaft goniometer. The layout was generally asymmetrical about the house, and large errors prevailed. It was decided to concentrate on measurements near the azimuths of Washington, D. C. and Glenville, North Carolina so that a wide-aperture system could be used. The 4 unipoles were mounted at the corners of a square whose diagonals were 200-ft long. Throughout a range of ±40° from 0° azimuth, the error in azimuth determination was never greater than 0.8°, although the phase error corresponding to that amount was about 10°. Attempts to evaluate the polarization error are discussed. (a-3, b-3, c-1, d-1, e-0, f-Quarterly report. See Abstract No. 3087)

3133. BURGMANN, V. D., AND SHERIDAN, K. V., "Microwave Direction Finding for Aircraft Navigation," Jour. Inst. Nav., vol. 3, pp. 251-269; July 1950. ABSTRACT: An aircraft direction finder oper-

ating in the 3-cm wavelength band is used to observe the bearings of fixed beacons on different spot frequencies. Frequency sweep on the receiver enables the frequency (for identification) and bearing to be displayed in rectangular co-ordinates on a cathode-ray tube. Tests to determine the value of the system for homing, for maintaining a track, and for various other purposes, are described. (a-5, b-1, c-1, d-1, e-0, f-Description)

3134. ANONYMOUS, "Antenna Research and Development," Antenna Lab., Ohio State U. Research Foundation, Interim engineering rept. for period ending 30 June 1950, TIP No. U12206; 1 July 1950. ABSTRACT: FM was reduced by using a CW reflex klystron oscillator and a square-wave modulated 2-cavity klystron amplifier as a signal generator. A battery pack supply for the reflector anode and well-regulated power supplies for the beam anode and control electrode of the oscillator were necessary. A sensitivity of 2 v. per degree phase error was obtained from the phase-error detector at a 20-db difference in level between the reference and received signals. A phase error of 12° was necessary to activate the servo system. The QK60 magnetron increased the usable output of the demodulated signal fed to the receiving channels; a 3-stub crystal holder increased the available power by 6 db. A 457-kc mixer is being considered to obtain a 1000-c output. Unexplained discrepancies arose in efforts to verify the basic theory of the system for point-by-point measurements with or without a controlled reflection. Several minor improvements were made to a 3-cm radiation-efficiency meter. A sandwich-type hybrid ring was constructed for use as a phase comparator at 750 mc. An improved line stretcher with a special construction for increased sensitivity in detecting small standing waves was satisfactory Impedance compensation was obtained by changing the shape of the antenna with flat-sheet unipoles. Synchronous rectifiers, modulator power supplies, selective amplifiers, a field strength recorder, and a square-root recorder are discussed. (a-3, b-3, c-1, d-1, e-0, f-Report. See also TIP No. 10606)

3135. BURKHARDTSMAIER, W., AND FINKBEIN, Y., "Circularly Grouped Aerials as Omnidirectional and Directive Radiators," Elektrotechnik Berlin, vol. 4, pp. 239-244 and 284-290; July and August 1950. ABSTRACT: From fundamental theory expressions are derived for the radiation characteristics, impedance, gain, etc., of an antenna system comprising a number of similar vertical elements at the vertices of a regular polygon, with or without a central radiator. Application of such systems for reduction of fading, optimum design for directional operation, and the multiple-feed system are discussed. (a-3, b-1, c-4, d-4, e-0, f-Theory)

3136. PHILLIPS, W. E., "Radio Receiver R-323(XW-)/GRD (Experimental Model)," Lavoie Labs., Inc., Interim engineering rept. nos. 12-13; May-August 1950. Contract No. (W28-099-ac-77), TIP No. R3753. ABSTRACT: Space was saved by including the circuits of the AVC unit on the IF amplifier chassis. To make the tuning control unit of radio set AN/GRC-30 (XW-) directly usable in the R-323, those change-over relays not required were made into a separate unit. The revised timing control can now be used with either set. A new trimmer capacitor is smaller than the foreign made unit now used with each crystal position. It may prove superior under shock and vibration. A sample capacitor had a range of 2 to 36 mmf. Tests on IF strip components showed the selectivity characteristics of the 3.3 mc transformers to be dependent on the dimensions of the can. Tests on the D/F amplifier appeared satisfactory. (a-3, b-3, c-1, d-1, e-0, f-See Abstract Nos. 3121 and 3063)

3137. SCHULMAN, J. R., AND OTHERS, "Radio Compass AN/ARN-17(XA-1), Melpar, Inc., Interim engineering rept. 17 June-17 August 1950, TIP No. U14085; 31 August 1950. ABSTRACT: Packaging of the receiver and construction of the control panel and mounting were completed; these units operated satisfactorily. The RF assembly is being aligned for satisfactory operation on all 4 bands. Excellent tracking of the RF and local-oscillator circuits was obtained by using non-linear lead screws in the tuner. The servo system employed in cutting these screws is described. All components of the loop-control unit withstood an ambient of 90°C. The oscillator temperature-stability requirements should be met on all bands. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract Nos. 3131 and 3136)

3138. ABBOTT, F. R., AND FISHER, C. R., "Measured Directivity Induced by a Conducting Cylinder of Arbitrary Length and Spacing Parallel to a Monopole Antenna," Proc. IRE, vol. 38, pp. 1040-1041; September 1950. ABSTRACT: Curves are given for determining the directivity, given the separation of the parasite from the antenna and also its height. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3139. DE WALDEN, S., AND SWALLOW, J. C., "The Relative Merits of Presentation of Bearings by Aural-Null and Twin-Channel Cathode-Ray Direction-Finders; Proc. IEE, Part III, vol. 97, pp. 362-365; September 1950. ABSTRACT: The visual method of bearing display is shown to be superior in nearly all respects except for its relative ineffectiveness at very low signal-to-noise ratios. (a-3, b-1, c-1, d-5, e-467, f-See Abstract No. 3045)

3140. GOLDMAN, S., LEPAGE, W. R., ET AL., "Signal Resolution in Wide Aperture D/F Systems in the Presence of Noise," Institute of Industrial Research, Syracuse U., Progress rept. no. 1, 1 June-1 September 1950, TIP No. R3969. ABSTRACT: Various methods are discussed for improving signal resolution in D/F systems. Algebraic methods are considered for the simple cases in separating signal components when the directional characteristic of the antenna is idealized into a step-like pattern. A method of moments was derived which permits the determination of the magnitude and direction of the signals from the shape of the combined signal when only 2 signals and no noise are present. The limiting aspects of noise on the minimum angular separation were analysed. Modifications were applied to the harmonic components of the antenna pattern in a comb filter, thereby artificially sharpening the pattern and increasing the possible resolution. The space positions and strengths of 2 superimposed signals can be computed if the first and second harmonic amplitudes and phase positions are known. The pattern shape for a single signal was employed in the calculation. The possibility of automatically carrying out the solution by an electrical system is considered. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3141. GUERTLER, R., "Impedance Transformation in Folded Dipoles," Proc. IRE, vol. 38, pp. 1042-1047; September 1950. ABSTRACT: Reprint of article appearing in Proc. IRE (Australia), vol. 10, pp. 95-100; April 1949. See Abstract No. 3019. (a-4, b-1, c-1, d-11, e-0, f-Experimental analysis)

3142. HORNER, F., "Some Experiments on the Accuracy of Bearings Taken on an Aural-Null Direction-Finder," Proc. IEE (London), Part III, vol. 97, pp. 359-361: Discussion, pp. 362-365; September 195). ABSTRACT NO. 1: The paper describes some tests to determine how the accuracy of a bearing taken on an aural-null rotating H-Adcock direction-finder depends on the width of the minimum and on the receiver output noise-level. The results pertain to bearings taken on a steady tone-modulated signal by an experienced observer working under good conditions. They indicate that bearings taken under these conditions will have standard deviation of between 1/40 and 1/20 of the arc of silence except for very small arcs, even when the bearings are derived from very few oscillations of the antenna system. Accuracy is improved if the number of complete oscillations is greater than about five. Accuracy is degraded if the angle through which the antenna is swung is increased to improve the quality of the signal at the limits of the swing. Differences of at least two to one in the standard deviation of observed bearings may occur between different observers, and with one observer at different times. Compared with these changes, any changes due to the use of different receiver output noise-levels are considered to be small. ABSTRACT NO. 2: Tests to determine how accuracy of bearing taken on aural-null rotating H-Adcock direction finder depends on width of minimum and on receiver output noise level. (a_1-5, a_2-3, b-1, c-1, d-5, e-0, f-Description)

3143. JORDAN, E. C., Electromagnetic Waves and Radiating Systems, New York, Prentice-Hall, Inc.; September 1950. ABSTRACT: Chapter 16 provides an investigation of ground wave, space wave, and surface wave propagation. Above citation represents 1st of several printings of the book at later dates. (a-4, b-6, c-1, d-1, e-0, f-Reference book)

3144. MILLINGTON, G., "The Computation of Great-Circle Bearings and Distances," Marconi Rev., vol. 13, no. 98, pp. 89-101; 3rd quarter; 1950. ABSTRACT NO. 1: To avoid the necessity of using seven-figure logarithms to obtain four-figure accuracy when using the standard formulas, trigonometrical transformations are used, a simplified rule of signs is adopted and the resulting computation is presented in a standard tabular form. ABSTRACT NO. 2: General equations are presented for the great circle bearing and distance to any point on the earth from any other point. These equations have been used as the basis of a computer program at SwRI using the WIZ language for a GE 225 computer for bearings and distances from the D/F sites at Southwest Research Institute in San Antonio. ABSTRACT NO. 3: The standard formulae for the computation of great circle bearings and distances are subject to small difference difficulties necessitating under some conditions the use of seven figure logarithms to obtain four figure accuracy. This trouble is

overcome by trigonometrical transformations, so that the accuracy of the tables does not need to be higher than that of the final answer. At the same time, the rule of signs associated with the formulae is simplified and embodied in a standard table used for the computation of any given case. It is shown that the transformed equations degenerate directly to the simple projection formulae for short distances where the effect of the earth's curvature is negligible. (a_1-3, a_2-4, a_3-1, b-2, c-1, d-5, e-743, f-Mathematical analysis)

3145. SCOTT, J. C. W., "The Poynting Vector in the Ionosphere," Proc. IRE, vol. 38, pp. 1057-1068; September 1950. ABSTRACT: The equations of motion of ionospheric electrons in the field of plane electromagnetic waves subject to the frictional force of collision and to the force of the earth's magnetic field are developed in a form permitting graphical calculation of the wave polarization. The complex Poynting vector is then calculated in terms of the polarization, the complex refractive index, and a third functional related to the forward tilt of the electric vector. Graphical integration is used to obtain curves representing the direction of energy flow for the ordinary and extraordinary modes, in a parabolic distribution of ionization for fixed values of geomagnetic latitude, collision frequency, and wave frequency for the case of vertical wave propagation. When collision is taken into account, the deflection has a small westward component for both ordinary and extraordinary modes. At zero collision frequency the deflections are in the vertical plane of the earth's field; the ordinary mode bending towards the poles and the extraordinary mode towards the equator. The normal ionization gradient with latitude, together with diurnal expansion and contraction of the ionized region, can explain the diurnal variation in the f^x - f^0 critical frequency difference as due to the diurnal variation in the total path deflection. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3146. TODD, A. C., "An Antenna Analyzer," Electronics, vol. 23, pp. 82-87; September 1950. ABSTRACT: Multi-element parallel arrays alone are studied. The instrument described will handle up to 5 elements, the pattern being presented on a crt screen in polar or rectangular co-ordinates and the parameters set by 16 dials controlling poteniometers and selsyn transformers. Analysis shows that the normal expression for the radiation pattern of such an array, with arbitrary spacing, phasing, and loading for each element, can be transformed into the sum of a sinusoidal voltage, representing the contribution of the reference element, and a series of phase-modulated voltages representing the other elements. A 100 kc/s crystal-oscillator source, after frequency-tripling twice, is used to provide these voltages, but those corresponding to elements other than the reference element are phase-modulated up to ± 100° at 60 c/s before frequency-multiplication. Phase modulation is effected, and controlled by potentiometer and selsyn settings, in a clipper-differentiator circuit following a sawtooth oscillator driven from the 100 kc/s source. The output level of each channel is adjusted in accordance with the corresponding element length X current figure and all 5 outputs are fed in series to the crt indicator unit. Good agreement is shown between a calculated pattern and the crt presentation. (a-1, b-2, c-1, d-1, e-0, f-Description)

3147. NEWMAN, M. M., "Impulsive Radio Interference and Reduction Methods," Proc. NEC, Vol. VI, p. 238; 25-27 September 1950. ABSTRACT: Impulsive interference excitation in a receiver greatly increases the duration of the original disturbance, so that removing or limiting the disturbance within the receiver after the first circuits have been "impulse-excited" results in considerable loss of signal carrier as well. However by removing the interference before it reaches the receiver a very much smaller portion of the signal carrier is lost and a very much greater number of disturbances can be tolerated than with any scheme of limiting within the receiver. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

3148. ANONYMOUS, "CONSOL, A Radio Aid to Navigation, a Brief Description of Its Use, with Details of the Service and Cover Provided by Existing Stations," Ministry of Civil Aviation (British). See Department of Commerce PB102330; October 1950. ABSTRACT: Report covers Navigational aids and Radio Beacons of Great Britain and MCA P 59; S. O. Code Nos. 22-180-0-50, 2nd Edition (a-3, b-3, c-1, d-5, e-0, f-Description)

3149. ALLISON, J. L., "Direction Finder Data Transmission System," Federal Telecommunication Labs., Inc., Interim engineering rept. no. 1, July-September 1950, TIP No. R4522; October 1950. ABSTRACT: Development was started on equipment for coding, transmitting, and decoding D/F bearing and quality information from several D/F stations to a plotting center by means of binary digital methods. A type-291 D/F is being prepared for tests to study the correlation between bearing accuracy and received signal characteristics. A decoder is being considered to transform from binary digits directly to 400-c phase. The form of digital data was not determined, but a tentative form using 2 modulation tones for each digit appears suitable. A diagram is included of the quality decoding circuit. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3150. GROSSKOPF, J., "The Theory of Receiving Aerials," Frequenz, vol. 4, pp. 249-261; October 1950. ABSTRACT: The limits of applicability of transmission-line theory to nonrectilinear antenna arrangements are discussed, and theory is developed for circular and rhombic receiving antennas with nonstationary current distribution. Even for frame antennas of small size, slight departures from previously accepted theory manifest themselves as a dipole effect. Other common nonrectilinear arrangements, in particular asymmetrical ones, are also considered. (a-3, b-1, c-4, d-4, e-0, f-Theory)

3151. HARVEY, N. L., "A New Basis for the Analysis of Radio Navigation and Detection Systems; Sylvania Technologist, vol. 3, pp. 15-18; October 1950. ABSTRACT: Certain developments in the theory of information transmission are applied to radiolocation systems. A brief explanation is given of the basic principles that (a) the transmission and receiver bandwidths are mutually independent system parameters, (b) the system resolution is the Fourier transform of the power spectrum, and (c) the type of modulation used to generate the spectrum is unimportant. (a-5, b-3, c-1, d-1, e-0, f-Survey)

3152. KING, R., "Asymmetrically Driven Antennas and the Sleeve Dipole," Proc. IRE, vol. 38, no. 10, pp. 1154-1164; October 1950. ABSTRACT NO. 1: General expressions for impedance and current distribution of asymmetrically driven, cylindrical aerials are derived from an integral equation, which is solved by the method of successive approximations. An approximation for the impedance is obtained which involves a series combination of the known impedances of symmetrically driven aerials. Impedance and current distribution of a cylindrical $3\lambda/4$ aerial, driven $\lambda/4$ from one end, are evaluated and its wide-band properties are discussed. Expressions for the impedance and current distribution of a sleeve dipole are readily obtained from the foregoing, since the sleeve dipole with its image is equivalent to two superposed asymmetrically driven aerials. Impedance and current distribution are determined for a $3\lambda/4$ sleeve dipole above a conducting plane, when it is driven $\lambda/4$ from the plane: its wide-band properties are much superior to those of a simple dipole. ABSTRACT NO. 2: The problem of determining the distribution of current in and the impedance of a cylindrical aerial asymmetrically driven by a discontinuity in scalar potential is formulated. An integral equation is derived and solved by the method of successive approximation to obtain general expressions for the current and the impedance. A simple approximate expression for the impedance of the asymmetrically driven aerial involving a series combination of the known impedances of symmetrically driven aerials is obtained. The impedance and the distribution of current for a cylindrical aerial of length $3\lambda_0/4$ driven $\lambda_0/4$ from one end are evaluated. The broad-band properties are discussed. Since the sleeve dipole with its image is equivalent to a superposition of two asymmetrically driven aerials, expressions for the impedance and distribution of current are obtained readily from the current distribution of the asymmetrically driven aerial. Both quantities are determined for a sleeve dipole of overall length $3\lambda_0/4$ over a conducting plane driven $\lambda_0/4$ from the plane. It is shown that this aerial has broad-band properties very superior to those of a conventional dipole. (a_1-5, a_2-1, b-1, c-1, d-1, e-430, f-Discussion)

3153. LEITNER, A., AND SPENCE, R. D., "Effect of a Circular Groundplane on Antenna Radiation," Jour. Appl. Phys., vol. 21, pp. 1001-1006; October 1950. ABSTRACT: The field of a vertical $\lambda/4$ antenna above a circular conducting disk of zero thickness is calculated theoretically by use of the wave functions for the oblate spheroid. Assuming a sinusoidal current distribution in the antenna, calculations are made of the currents in the ground plane, the radiation resistance and the radiation pattern of the system for various values of the ground plane radius. These results are applied to a study of the field distortion due to finite ground planes. (a-5, b-1, c-1, d-1, e-0, f-Analysis)

3154. MOON, J. H., "The Development of the Aircraft Automatic Radio Compass," Jour. Inst. Nav., vol. 3, pp. 393-403; October 1950. ABSTRACT: Major problems encountered in the development of airborne D/F equipment are reviewed, and a description is given of the latest electrical and mechanical improvements evolved to provide fast-moving aircraft with instantaneous position indication. Various ways of using the information provided by the direction finder

are discussed, and questions of calibration and ultimate accuracy are considered. (a-5, b-1, c-1, d-1, e-0, f-Survey)

3155. ANONYMOUS, "Antenna Research and Development," Antenna Lab., Ohio State U. Research Foundation, Final engineering rept., Vol. 2, 1 October 1949-30 September 1950, Contract W33-038-ac-16520, TIP No. U17062; 1 October 1950. ABSTRACT: An automatic equiphase contour plotter utilizing a hybrid tee was developed for rapidly and accurately determining phase contours. A constant-phase reference signal enters the series arm of the tee; the received signal enters the parallel arm. The error voltage produced in the tee output due to the phase difference in the reference and received signals drives a servo system through a balancing potentiometer. The servo system positions the receiving probe to receive a signal which balances the error voltage. The recorder pen, which is mechanically coupled to the probe, records the equiphase contours as the test antenna rotates. The use of 2 helixes in a cylindrical wave guide for phase shifting was investigated. Lossy material (space cloth) in this device reduced amplitude variations and increased phase accuracy without introducing prohibitive loss of power. The device may be used over a 20% frequency band with a phase accuracy within ± 14.5°. A low-pass filter was designed for use with the dual frequency modulation equipment. The demodulated output for the dual modulation scheme was shown to be obtained only from even-powered terms. A polynomial approximation of a crystal curve indicated the device follows the square law only in the lower region of the operating range. The dual modulation method was shown to indicate the magnitude of an error due to spurious reflections, but its use is limited to cases where the reflected signal is small compared to the direct signal. Workable models of the phase comparator and the loop-type directional couplers for the panoramic impedance plotter were constructed. The use of design procedures and formulas was shown to be feasible for determining the geometry of a radiating system consisting of a dipole in free space or in the presence of a reflector; optimum impedance characteristics can be obtained. Wave-analyzer installations were replaced with selective amplifiers. A method is shown for extending the dynamic range of instrument diodes by employing servo choppers as synchronous mechanical rectifiers. Application to the efficiency-measuring instrumentation demonstrated the superiority of the method. A method of stabilizing the decibel field-strength recorder is described. (a-3, b-3, c-1, d-1, e-0, f-Description)

3156. LEE, D., AND DIEHL, E. J., "Ground Portable Radio Direction Finder," Melpar, Inc., Interim engineering rept. 1-30 September 1950, TIP No. R4165. See also ASTIA AD 46549; 16 October 1950. ABSTRACT: A lightweight HF direction finder of the aural null type is being developed for use by search and rescue parties. A 36-in.-square loop for the mock-up antenna assembly was made of 3/8-in.-diameter Al tubing. Its measured Q was 35 at 12 mc, increasing to over 300 at 4.5 mc. Preliminary measurements on a breadboard 2 mc IF unit, comprising 3 stages of IF amplification and a second detector, indicated that the circuitry will meet requirements. The audio power output specification can be met by using 1 Raytheon QF-721 pentode. Calculations of loop performance indicated that the sensitivity specification can be met at 490 kc where the voltage induced is the smallest. Gain control specifications can be met by varying the screen voltages of the first and third IF stages. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract Nos. 3062, 3163, and 3388)

3157. BOLINDER, F., "Fourier Transforms in the Theory of Inhomogeneous Transmission Lines," Proc. IRE, vol. 38, p. 1354; November 1950. ABSTRACT: The Fourier integral theorem is applied to derive an expression for the reflection coefficient at the sending end of an inhomogeneous transmission line when the receiving end is matched. The method can be applied to acoustic waves. (a-5, b-1, c-1, d-1, e-0, f-Theory)

3158. GILVARRY, J. J., "Application of Liouville's Approximation to the Blind Navigation Problem," Jour. Appl. Phys., vol. 21, pp. 1195-1196; November 1950. ABSTRACT: An earlier paper is referenced (Jour. Appl. Phys., vol. 21, pp. 753-761; August 1950) where the differential equation is considered which determines the position of a vehicle from dynamical measurements of the non-gravitational acceleration be made internally. Three linear approximations to the gravitational field g (r) of the earth, which lead to explicit solutions of this equation, are considered and their limitations are discussed. An interval-wise solution (linear continuation) for trajectories of extended range is described, which is based on such linear approximations and has definite advantages in this application. The theory is applied to the trajectory of the German A10 vehicle. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3159. JONES, J. R., "Instantaneous Direction Finding," Electronic Eng. (England), vol. 22, pp. 481-482; November 1950. ABSTRACT NO. 1: A historical account of the development of direction-finding equipment using cathode-ray tubes, with descriptions of a pre-war and a wartime model. ABSTRACT NO. 2: Development of modern cathode ray apparatus providing automatic indication of distant signal source; novel features of compact, versatile naval version; photographs (a_1-3, a_2-3, b-2, c-1, d-5, e-0, f-Descriptive survey)

3160. RICHARDSON, A. G., "Direction Finder Recorder and Storage Facilities," Federal Telecommunications Laboratories, Inc., Interim engineering report nos. 1 and 3; September-November 1950, TIP No. R4418. ABSTRACT: An experimental model of a direction-finder recorder and storage facilities are being developed to receive signals from direction-finding apparatus employing a rotated-cardioid antenna pattern which delivers a sine-wave reference signal of a phase corresponding to the azimuthal position of the antenna pattern and a substantially sinusoidal receiver output voltage whose phase is a function of the direction of arrival of the signal. These signals may lie between 30 and 150 cps, depending on the particular direction-finding system. The recorder is to compare the phases of the 2 signals, convert them into decimal figures, and then record them on paper with time and calender-date information. (a-3, b-3, c-1, d-1, e-0, f-Description)

3161. TRUE, V., "An Automatic Antenna-Tuning Unit," NRL Report 3755. See also Department of Commerce PB102962; November 1950. ABSTRACT: An antenna-tuning system has been designed to match automatically the input impedance of a 35-foot whip antenna to a 50-ohm coaxial transmission line over the frequency range of 2 to 18 Mc. This unit has been designed specifically to operate with a Naval Communications Transmitter, type TCK (400-watt output), but the design is such that it is applicable to a wide variety of automatic impedance-matching problems with only minor variations. A satisfactory solution to the technical problems peculiar to such a system has been attained. Detailed consideration was limited to those components designed especially to fill the requirements of this problem. It is concluded that the principal limitations of the range of application of this system are of a physical nature, such as the maximum tuning ranges and voltage ratings available in continuously variable capacitors and inductors. (a-3, b-3, c-1, d-1, e-0, f-Description)

3162. SCHULMAN, J. R., AND DIEHL, E. J., "Radio Compass AN/ARN-17(XA-1)," Melpar, Inc., Interim engineering rept., 17 August-October 1950, TIP No. U14392; 14 November 1950. ABSTRACT: Redesign of the modulator stage provided additional gain, a gain variation of 2:1 over the entire frequency range, and good balance. The loop sensitivity over band 4 was 30 µv./m. The use of a parallel-T feed-back network in the loop-control circuits provided better compass operation and reduced the effect of modulation on the incoming signal. The IF rejection specification was met through the use of a high-Q trap in the RF-tube plate circuit. An increase in the over-all gain of the receiver is required for bands 1 and 3. Higher circuit Q's and a more remote cutoff tube should enable the cross-modulation specification to be met. The use of 400-c. power would aid in packaging, maintenance, and reliability of operation. Repackaging of the RF unit is required for satisfactory servicing and operation reliability. Repackaging suggestions are included. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract Nos. 3131, 3136, and 3137)

3163. DIEHL, E. J., "Ground Portable Radio Direction Finder," Melpar, Inc., Interim engineering rept., 1-31 October 1950, TIP No. R4600; 27 November 1950. ABSTRACT: Temperature-coefficient measurements on samples of the series-19 Radio Condenser Co. variable-tuning capacitor indicate that the 0.08% frequency-stability specification can be achieved with proper temperature compensation of the oscillator coils. The measured frequency distribution of the standard plate tuning capacitor was fairly linear, permitting a desirable dial calibration with little frequency crowding at the center. The loop transformer gain and carrier field strength required for a 6-db. S/N ratio were calculated at 3 and 6.83 mc. These calculations indicated the S/N specification can be met throughout the 490- to 12-mc. range with results marginal at 490 kc. The packaged wide-band IF crystal filter met selectivity specifications down to the 57-db. attenuation response. At 60 db., the bandwidth was approximately 11 kc.; 9 kc. was specified. Tentative measurements on the narrow-band IF crystal filter indicated a marginal bandwidth at the 60-db. response. (a-3, b-3, c-1, d-1, e-0, f-Description. See also Abstract Nos. 3156 and 3388)

3164. KING, R., "Theory of Collinear Antennas," Jour. Appl. Phys., vol. 21, pp. 1232-1251; December 1950. ABSTRACT: The analysis

of a system of collinear antennas is practicable only if the transmission lines feeding the system are in the neutral plane of the electromagnetic field. Two cases are considered: a single center-driven unit, (a) with two symmetrical collinear parasitic elements, and (b) with the outer elements driven from the center unit by means of phase-reversing stubs. Approximate expressions are obtained for the currents and for the mutual and self impedances of the elements. The particular case of λ/2 dipoles is treated in detail. The advantages of the collinear array with phase-reversing stubs as compared with arrays in which each element is center driven are discussed. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3165. LINDSAY, D. G., BLOM, J. P., AND GILCHRIST, J. D., "Distance-Measuring Equipment for Civil Aircraft," Proc. IRE (Australia), vol. 11, pp. 307-315; December 1950. ABSTRACT: A description of the development of a ground-beacon interrogator-responder system. Requirements and circuitry are outlined. Beacon reply pulses are delayed by 12.4 μs and actuate a locking system in the aircraft, which requires 3 to 5 successive correct pulses to operate. Range is displayed by meter. (a-5, b-1, c-1, d-11, e-0, f-Description)

3166 WILLIAMS, H. P., Antenna Theory and Design, vols. 1 and 2, Pitman and Sons, London; 1950. ABSTRACT: The first volume, which is independent of the second, deals with the theory of antenna. The treatment is necessarily mathematical, but numerous diagrams are used in illustration of the theory. The second volume is concerned primarily with antenna design. All types are considered and many curves, diagrams, and photographs are given. A full bibliography is included in both volumes. (a-2, b-6, c-1, d-5, e-0, f-Book)

3167. ZINKE, O., "Wide-Band Aerials and Resonant Circuits with Simple and Double Compensation," Fernmeldetech. Z., vol. 3, pp. 454-458; December 1950. ABSTRACT: Shows how the driving-point voltage standing-wave ratio of an aerial, which behaves like a series LCR circuit with constant parameters, can be reduced from 2.6 to 1.4 over a band equivalent to a ±45° phase angle for the aerial alone, by shunting a simple parallel LC circuit across the aerial terminals, and to 1.2 by combined parallel LC across the original terminals and series LC in series with the input. A corresponding method is applicable to the inverse aerial characteristics, and it is shown how to allow for frequency-dependent parameters in practical dipole aerials. (a-3, b-1, c-4, d-4, e-0, f-Analysis)

3168. MYERS, J. J., "Radio Direction Finder System Analyzer," Electrical Engineering Research Lab., U. of Illinois, Technical rept. no. 12, TIP No. U15505; 1 December 1950. ABSTRACT: In order to evaluate a large number of radio direction finder systems, an analyzer was developed which feeds a 175-kc. voltage to the input of the D/F equipment (exclusive of its collector system). A second voltage can be applied which corresponds to a second interfering signal from the same source but different path. The phase of the second voltage may be varied to simulate a difference in direction of the interfering signal relative to the desired signal. The 2 channels are connected through 20 pairs of phase shifters and amplitude controls to give the effect of a given array of antenna elements. The circuits, construction, adjustments, calibration, and use of the analyzer are described. (a-3, b-3, c-1, d-1, e-0, f-Report)

3169. WILSON, L. W., "Evaluation of 3000-MC Search and Direction-Finding Antenna," Navy Electronics Lab., San Diego, Final rept., 11 December 1950, TIP No. U16490. ABSTRACT: Free-space patterns of the antenna were obtained over a microwave path 400-ft. long and 35 ft. above a ground plane. The transmitting antenna was fixed; the antenna under test, functioning as a receiving antenna, was rotated in both azimuth and elevation. A DBM direction-finding antenna mount converted to rotate slowly (2.4 rpm) was placed in the regular antenna-testing mount. Horizontal-plane patterns were taken with the vertical axis of rotation tilted 0, 5, 10, 15, and 20° from the vertical. Vertical-plane patterns were taken at 0° azimuth, which would correspond with the beam axis if there were no beam deviation. Signals were demodulated by a bolometer element and fed into a recording system. The free-space patterns showed a wide pattern variation with polarization and frequency. No usable pattern existed at many frequencies and polarizations. (a-3, b-3, c-1, d-1, e-0, f-Description)

3170. ROSS, W., "Direction of Arrival of Ionospheric Radio Waves," Nature, vol. 166, no. 4233, pp. 1011-1014; 16 December 1950 ABSTRACT: Early experiments on medium wavelengths; extension to shorter wavelengths; indirect evidence of ionospheric tilts; recent measurements of ionospheric tilts; studies of fading. (a-3, b-1, c-1, d-5, e-0, f-Study)

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3171. DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, "Radio Direction-Finding and Navigational Aids (Some Reports on German Work Issued in 1944-45)," Radio Research Special Report No. 21, London: His Majesty's Stationery Office. See also Department of Commerce PB105763; 1951. ABSTRACT NO. 1: Translations of nine hitherto unpublished direction finding papers by German experts. The nine papers and their abstracts are as follows: Paper No. 1, "Fundamental Problems of Direction-Finding and Range-Finding (Distance Measurement)," by PAUL VON HANDEL. The question as to the limit of accuracy of direction-finding is a question of the physics of wave propagation as to whether the waves pass via the great circle planes of the earth and how accurately they do this, i.e., how much do the waves deviate from the great circle. General remarks are made concerning loops, Adcocks, wide base systems, multipath errors and transit time measurements. It is concluded that direction measurements and distance measurements are based on the measurement of phases. The limits of accuracy depend upon substantial differences in physical factors and measuring technique, but it appears that the same degree of accuracy is attained in both methods. Distance measurements with impulses via the ionosphere and over considerable ranges still requires a considerable amount of research work in order to arrive at a clear basis. Impulse methods afford distinct advantages on account of the greater freedom from jamming and increased power. Work is therefore in progress to develop impulse methods for the measurement not only of distances but also of angles. Paper No. 2, "Considerations of the Physical Limits for the Possible Methods of Navigations with Ground Waves," by WOLFGANG PFISTER. Detailed remarks and experimental results on the accuracy of measurements on ground waves for direction finding and ranging. Includes wide base measurements and time elapsed measurements. Paper No. 3, "Receiving and Direction-Finding Installations with Beamed Characteristic (Sector D/F Installations)," by HERMANN JANNSEN. The Naval requirement for obtaining the bearing, in addition to the reception, of extremely weak transmitters has led to the development of direction-finding installations with directional aerial systems. These installations can be used at choice either for highly sensitive reception or for ascertaining the bearing of very weak transmitters, for which purpose both maximum and minimum direction finding methods are possible. The considerable lateral steepness of the D/F zero position renders such installations eminently suitable for the exclusion of interfering transmitters. After a brief explanation of the requirements which the installations have to meet, the various possible lines of development are indicated, followed by a description of the construction and mode of operation of various types of such installations. The first sector D/F installation constructed for the Navy, the "Guben" long wire sector D/F installation, operates on the phase-shifter principle. With it, it is possible to take a bearing in a sector of ± 20°. As already mentioned above, the sector is fixed by the width of the directional characteristic of one directional aerial. The installation was constructed for a wave range of 100 to 200 m. By its means, it was possible to observe bearings on transmitters having a (calculated) field strength of about 2×10^{-9} volt/m with a minimum width of 4°. The wave range of 100 to 200 m is, as is well-known, very difficult to receive during the daytime, since then there is only one incident ground wave of very low intensity. Because of its vertical polarization direction, this can be very well received with long wire aerials, which at the same time combine the advantages of unidirectional reception and good wide band properties. The disadvantages of dissymmetry of the D/F polar diagram and of the elevation error inherent in the "Guben" installation, the forerunner of the "Wullenwever," have been practically eliminated in the latter by the use of a circular aerial group. The installation has a uniformly rotatable, symmetrical polar diagram, as if peculiar to mechanically rotatable linear groups. The elevation error lies within a few tenths of a degree and therefore does not cause any disturbance, since the D/F errors caused by disturbances in the ionosphere are much greater. The utilizable D/F sector can be extended to 360°. The installation is built for a wave range of 20 to 40 m, but the first experimental results showed that operation within a wave range of 15 to 50 m is quite possible. There are two types of Wullenwever installation, one with single circuit compensator erected at Frickingen by the Entwicklungsinstitut für Nachrichtenmittel Konstaz and one with a Stenzel sine compensator built by Telefunken. Paper No. 4, "Possibilities and Limitations of Direction-Finding with Sky Waves," by WILHELM CRONE. The following remarks refer solely to direction-finding systems, transit time measurements will be left entirely out of consideration. The natural limit of a direction determination is given by the inaccuracy of the propagation of the waves on the path from transmitter to receiver. It is important to know this limit because in its turn, it limits the expenditure involved in the construction of the measuring apparatus. It is the object of all methods of measurement to attain this natural limit. In what follows I shall endeavour to show to what degree the apparatus hitherto employed satisfies this condition, and by what steps it is possible to increase

the accuracy of measurement. It has in fact been possible to develop measuring apparatus which is free from instrument errors to a greater extent than hitherto, although at the price of a greater expenditure. By means of such a measuring device we have obtained information in the course of lengthy and systematic observations, so that we are now able to give a relatively clear picture of the magnitude of the actual deviations of short waves from the great circle, of the character of such deviations and of their variation, both daily and seasonal. I will consider the various factors which are involved in the direction determination of sky waves. In the course of their propagation via the ionosphere, short waves are subjected to a number of influences, the presence of which presents some difficulty in the exact determination of direction. The essential points are polarization, angle of elevation and the existence of multiple propagation paths. We should also include in the latter the scattered radiation of energy from the surroundings of the measuring system. Paper No. 5, "The Results of Measurements Made on the 2-Base "Komet" Installation at Ismaning," by R. WEBER. A report is made of the results of measurements carried out with a simplified 2-Base "Komet" installation over the range Ismaning near Munich to Kölby in Denmark. The object of the measurements was to show whether the accuracy in the azimuth determination of the 2-Base method agreed with the results obtained from earlier measurements on the I-Base method. Paper No. 6, "Radio Navigation by the Short-Wave Transit Time Method," by DR. W. DIEMINGER. Of the two possible methods of position finding by means of wireless waves, only the determination of direction (direction-finding) has been employed to any considerable extent in the region of short waves. The difficulties involved and the results obtained have already been reported. Of the other possible method, that of determining position by measuring the time of transit of electric waves from transmitter to receiver has certainly been tried occasionally but has never been employed on a practical scale. The following is an account of the difficulties which oppose a general application of this method and some possible methods of overcoming them. Paper No. 7, "Transit Time Difference Measurements with Sky Waves," by ANDREAS MATTES. A brief review will be given of the investigations made at the Air Radio Research Institute at Oberpfaffenhofen with the object of elucidating the possibility of navigation by means of the transit time difference measurements of short-wave impulses. Paper No. 8, "Measurements on Long and Very Long Waves," by FRITZ VILBIG. It is intended to elucidate the following problems concerning long and very long waves: (1) magnitude of the field strength fluctuations as dependent upon frequency and propagation path, (2) variation of field strength with time. Daily and annual variation, (3) cause of field strength fluctuations: polarization variation, phase influence or absorption effect, (4) participation of the ground wave, (5) the connection between propagation phenomena of long and very long waves to medium and transitional waves is to be sought, in particular also with regard to the propagation interference occurring. Paper No. 9, "The Accuracy Attainable in Long-Range Navigation with Very Long Waves and Short Waves, Employing the Hyperbolic and Distance-Measuring Methods," by G. DESSAUER and DR. W. CRONE. The accuracy attainable is indicated, taking in consideration the propagation conditions for very long waves. A proposal is made for a transit time difference method using very long waves. The propagation conditions for short waves are considered and the errors in distance measurement and hyperbola methods are estimated. Possibilities for the reduction of these errors are discussed and a proposal is made for characterizing the angle of elevation by special arrangements at the transmitter. ABSTRACT NO. 2: 1. Radio waves - Measurements - Germany; 2. Radio direction finding - Wave lengths - Germany; 3. Radio direction finders - Equipment - Germany; 4. Navigational aids - Germany; 5. Komet (German radio installation); 6. Hyperbolic functions - Germany; DSIR Rad R SR 21. Papers forming this report are translations of certain German reports captured in 1945. Contents: Paper no. 1. Fundamental problems of direction-finding and range-finding (distance measurement), by PAUL VON HANDEL. - Paper no. 2. Considerations on the physical limits for the possible methods of navigation with ground waves, by WOLFGANG PFISTER. - Paper no. 3. Receiving and direction-finding installations with beamed characteristic (sector D/F installations), by HERMANN JANNSEN. - Paper no. 4. Possibilities and limitations of direction-finding with sky waves, by WILHELM CRONE. - Paper no. 5. Results of measurements made on the 2-base "Komet" installation at Ismaning, by R. WEBER. - Paper no. 6. Radio navigation by the short-wave transit time method, by W. DIEMINGER. - Paper no. 7. Transit time difference measurements with sky waves, by ANDREAS MATTES. - Paper no. 8. Measurements on long and very long waves, by FRITZ VILBIG. - Paper no. 9. The accuracy attainable in long-range navigation with very long waves and short waves, employing the hyperbolic and distance-measuring methods, by G. DESSAUER and DR. W. CRONE. (a_1-4, a_2-3, b-3, c-1, d-5, e-762, f-Miscellaneous German reports)

3172. DOLUKHANOV, M.P., "Radiowave Propagation," Gosud Izdatvo Literatury po Voprosam Sviazi i Radio, 1951. ABSTRACT: Not available. (a-4, b-6, c-2, d-2, e-0, f-Reference)

3173. GABLER, H., "Direction Finders, Fundamentals and Applications," Deutsches Hydrographische Institut, Hamburg, Germany; 1951. See also Fernmeldetech. Z., vol. 5, p. 43; January 1952. ABSTRACT: A summarized treatment of the essentials of all the important theoretical and technical problems of radio direction finding in ship navigation. (a-3, b-6, c-4, d-4, e-324, f-Survey and summary)

3174. POWELL, R.M., "The Radiation Resistance of a Small Horizontal Loop Antenna over a Conducting Plane," Proc. NEC (Chicago), vol. 7, pp. 582-597; 1951. ABSTRACT: The radiation component of the resistance of small loop antennas is measured at uhf by shielding the loop to prevent radiation, and substituting a known or calculable load resistance for the series radiation resistance of the loop. Measurements in the range 300 - 400 mc are checked by an indirect method. The accuracy of the measurements is to within about ± 5 per cent. (a-3, b-1, c-1, d-1, e-0, f-Radiation measurement)

3175. SKILLING, H.H., "Electric Transmission Lines," New York: McGraw-Hill Book Company; 1951. ABSTRACT: Excellent reference for development and Beverage antenna theory. (a-4, b-6, c-1, d-1, e-0, f-Reference)

3176. WINLUND, E.S., "Survey of Radio-Frequency Transmission Lines and Wave Guides," Proceedings of the Radio Club of America (11 West 42 Street, New York City), vol. 28, no. 2, pp. 1-65; 1951. ABSTRACT: This paper gives the essential technical data from various published material on the principles of radio-frequency transmission lines and wave guides appearing between 1919 and 1936 followed by a bibliography covering later years. During this time the art grew to a mature state. The material was prepared and presented as a seminar paper at the Massachusetts Institute of Technology. The original manuscript by Mr. Winlund was submitted to the Radio Club for publication prior to World War II. The Publication Committee was hampered during the War, but when the pressure was relieved, publication was resumed. In the meantime many new references became available and were included in the bibliography. The editor received the manuscript only one year ago. Because of the delay a few additional remarks summarizing the general trends in the development of transmission lines from 1937 to 1951 are provided at the end of the paper. (a-1 and 4, b-2, c-1, d-1, e-626, f-Contains 684 references including 29 earlier than 1930. Probably contains all early papers applicable to the Beverage Wave Antenna)

3177. NOMURA, Y., "On the Propagation of Electric Waves from a Horizontal Dipole over the Surface of the Earth Sphere," Sci. Rep. Res. Inst. Tohoku Univ., Ser. B., vol. 1/2, pp. 25-49; January 1951. ABSTRACT: The electromagnetic field generated by a horizontal electric or magnetic dipole on or over a finitely conducting spherical surface is considered, and formulas for the magnitude of each of the spherical-coordinate components of the electric and magnetic forces are obtained. The field of the horizontal dipole is calculated from that of the vertical dipole. An approximate expression based on optical ray theory is also given. (a-3, b-1, c-6, d-6, e-0, f-Theory)

3178. SHAW, P.A., "Direction Finder Recorder and Storage Facilities," Federal Telecommunications Labs., Inc., Interim engineering rept. nos. 4 and 5, December 1950-January 1951, TIP No. R4763; Contract AF 28(099)259. ABSTRACT: This equipment is to receive signals from D/F apparatus employing a rotated-cardioid antenna pattern. The phases of the 2 signals are compared and converted into decimal figures. The values are recorded with time and calendar date information on 5 rolls of tape instead of 1 wide chart. The printed rolls can be removed and replaced at each service period; fully printed rolls can be removed from the mechanism and replaced without disturbing the operation. Investigation of the possibility of obtaining a time standard to maintain an accuracy of 0.001% showed that a tuning fork frequency standard must be employed. To eliminate the possibility of time failures as a direct result of loss of power, a Se rectifier is being used with provision for floating batteries across the time-frequency-standard power supply for operation during any period of loss of power. Time stamps utilizing die-cast and brass printing wheels are being compared to determine their relative durability and printing quality. A single servo system was selected for cod'ng and printing. (a-3, b-3, c-1, d-1, e-0, f-Progress report, see Abstract No. 3160)

3179. UDA, S., AND MUSHIAKE, Y., "Theoretical Calculation of the Input Impedances of Two Parallel Antennas," Sci. Rep. Res. Inst. Tohoku Univ., Ser. B, vol. 1/2, pp. 91-104; January 1951. ABSTRACT: Hallen's method for the calculation of the impedance of a single antenna is extended to a system of two linear antennas, and

the results of numerical calculations and their applications are given. (a-3, b-1, c-6, d-6, e-0, f-Theory)

3180. WAGNER, R.F., "Development of Standardised Procedures for Defining the Requirements of Aircrew Jobs in Terms of Testable Traits," School of Aviation Medicine, Randolph Field, Field, Final Report, TIP No. U17053; January 1951. ABSTRACT: Objectives of this research, conducted under contract by the American Institute for Research, were to define a practical group of job elements; develop a procedure based on the critical-incident technique (TIP U7705), which would permit persons with only elementary training in personnel procedures to make the job analysis; and test the feasibility of the job-analysis procedures. Job elements were identified and defined on the basis of job descriptions of typical aircrew specialties, data on relevant tests, current training data, and critical-incident data. Several preliminary field trials were made to revise the elements prior to a large-scale trial. During the latter, 887 interviews were conducted at 10 AFB's in the Strategic Air Command, yielding a total of 9566 critical incidents. A training course was given to the interviewers, AF technicians who had had little specific training in personnel work. Similar results were obtained by the 2 independent teams, the correlation between element frequencies being 0.93 for pilots, 0.91 for flight engineers, and 0.97 for radar operators, the 3 specialties studied. For each specialty, the distribution of incidents among the job elements gave a distinctive pattern of requirements. Classifications made immediately as the incidents were collected gave a pattern of element frequencies which corresponded closely to those obtained when the same incidents were analysed later. Recommendations are made for statistically refining the job elements, developing new aptitude measures to predict elements for which no satisfactory tests are available, establishing a system of routine recording of critical behaviors, and extending the procedure to other aircrew specialties. (a-3, b-3, c-1, d-1, e-0, f-Study)

3181. SCHULMAN, J.R., "Radio Compass AN/ARN-17 (XA-1)," Melpar, Incs., Interim engineering rept., TIP No. U16838; 17 October-16 December 1950. See also TIP No. U14392, 2 January 1951. ABSTRACT: Tests of the 100-c. R-107 loop motor at 400 c showed that - 50°C operation was unsatisfactory; a 100-c vibrator and transformer circuit was incorporated in the system because a 115-v 400 c and 26.5-vdc power system is being used to reduce weight and space. Repackaging of the RF assembly was nearly completed. The unit consists of plug-in trays with band-switch wafers on each. Tests of the 5899 RF pentode showed superior remote cut-off characteristics; the tube is to be incorporated in the circuits. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3182. DIEHL, E.J., "Ground Portable Radio Direction," Melpar, Inc., Interim rept. 1-30 November 1950, TIP No. R4601; 18 January 1951. ABSTRACT: Test and alignment procedures are outlined for the narrow-band crystal filter. A graph is included of the narrow-band IF-crystal filter response resulting from adjustment of the various parameters. With 2 sections cascaded, the 6- and 60-db responses will be 300 and 760 c, respectively. Additional work is required on the packaging of the crystal filters especially pertaining to the sealing problem. Preliminary packaging of the IF amplifier was completed. Satisfactory performance was obtained for gain, bandwidth, gain control, AVC characteristics, and power requirements. The audio-power output stage employing a QF721 pentode tube was constructed and potted in the same form factor as the crystal controlled BFO stage. (a-3, b-3, c-1, d-1, e-0, f-Report)

3183. ALLISON, J.L., "Direction Finder Data Transmission System," Federal Telecommunication Labs., Interim engineering rept. No. 2, October-November 1950. TIP No. R4739; February 1951. ABSTRACT: Esterline-Angus recorders were replaced by a method involving the taking of motion pictures of the indications on test recording instruments while bearings are being received. A D/F station placed in operation has provision to use a cardioid pattern and a propeller type of pattern from the same antenna array. Preliminary bearings are being taken on a type-291 D/F to investigate correlations. Consideration was given to the use of circular progressive (CP) binaries to avoid detent locking of the coding wheel prior to the transmission of the binary digit. Since the receiving end of the transmission system is to rotate to duplicate that at the transmitting end, the CP binary system cannot be fed directly into the servo which orients the output shaft. A system is under study for transmitting azimuth information by narrow-band frequency-shift carrier telegraph. A fine and a course resolver are employed at the transmitting and receiving ends. The FTR 9-E-1, a multichannel carrier-telegraph system is being considered for adaptation. The British Admiralty Signals Establishment was contacted for initiation of a program concerning development in correlation of data relative to bearing quality of signals. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3149)

3184. BIGELOW, R.P., "Wireless in Warfare, 1885-1914," United States Naval Institute Proceedings, vol. 77, no. 2; February 1951. ABSTRACT: The first man to send a message through the air without wires was Sir Thomas Preece, in 1885. Making use of the inductive properties of an electric current, Preece and a friend set up two long parallel wires in a pasture. When an interrupted current was introduced in one wire, the other wire, a thousand yards away, reacted in a similar manner. What happened was that as the current passed through one wire, it threw out an electric field, which, traveling through the air to the other wire, produced an action in the second wire similar to that which had started the field in the first wire. As the years passed, Preece improved his apparatus. In the 1890's he was able to transmit speech across Loch Ness (1-1/4 miles) through his parallel wires. The great difficulty with Preece's "wireless" was that it required such space. The parallel wires each had to be greater than the distance to be spanned, and were consequently unwieldy to handle. Two years after Preece's first successful transmission, Heinrich Hertz proved the theory of the mathematician Maxwell: that oscillation of a body containing current would set up an electric field similar to that set up by Preece's long wires. Hertz proved this in the laboratory, transmitting the field a few feet, through the use of two similar balls. It remained for a young Italian, Guglielmo Marconi, to make practical use of the discovery. In 1894, on his father's estate in Italy, Marconi succeeded in making a transmission, using the earth as one of his poles and an antenna as the other. Once Marconi had started, he expanded his operations with all possible speed. Applying immediately for a British patent, he carried his experiments to England, where by 1895 he had reached the distance of a mile, and by 1899 had sent messages across the Channel. Marconi quickly formed a company, which in ensuing years threatened to get a strangle hold on the radio industry. By 1901 Marconi had further improved his equipment, so that on December 12th, as he sat in a little room in Newfoundland, he heard faintly through the earphones three dots—S in Morse code—sent by an assistant in England! Wireless had crossed the Atlantic. (a-1, b-1, c-1, d-1, e-0, f-History of wireless and application to naval warfare)

3185. GERHARDT, J.R., "An Investigation to Determine Whether the 'Three Antenna Method' of Measuring Angle-of-Arrival of Radio Waves May Be Used as a Reliable Means of Measuring the Elevation Angle of a Transmitter," Electrical Engineering Research Lab., U. of Texas, Interim quarterly research rept. no. 1, 1 December 1950-28 February 1951. TIP No. U18928. ABSTRACT: The effects on reliability of 0° to 6° elevation angles and the variation of meteorological and ground conditions in the 1080- to 1150-mc band are being investigated using pulse techniques and antennas with 8°-azimuth and 45°-elevation beamwidths. A modified 3-antenna method was X-band-tested over a 2.5-mi overwater path. Preliminary data indicated that the system measures angles-of-arrival at X-band accurately to a few hundredths of a degree. The possible accuracy limits of the equipment at L-band frequencies were studied theoretically. The factors considered included the type of reflecting surface, the degree of curvature of the phase front of the transmitted beam, the angular separation between half-power points of the receiving antennas, and the effects of refraction due to meteorological conditions. Charts indicating refraction errors as functions of transmitter-to-receiver distance for a number of horizontally stratified atmospheres are appended. (a-3, b-3, c-1, d-1, e-0, f-Study)

3186. MEDHURST, R.G., AND POOL, S.D., "Mutual Impedance of Parallel Aerials," Wireless Eng., vol. 28, p. 67; February 1951. ABSTRACT: We have recently had to compute the mutual impedance between parallel non-staggered half-wave dipoles over a range of spacing up to one wavelength. Values of sine and cosine integrals were taken from the threee volumes in the W.P.A. series of mathematical tables. These values cannot be compared directly with such previous values as those of G. Barzilai ("Mutual Impedance of Parallel Aerials," Wireless Engineer, 1948, Vol. 25, p. 347), because of a curious error that has found its way into many mutual impedance calculations. Taking the aerials as infinitely thin, the mutual impedance can be expressed as $R \times F$, where F is a complex function of the spacing, involving sine and cosine integrals, and

$$R = \frac{1}{4\pi}\sqrt{\frac{\mu}{\epsilon}}\ \text{ohms},$$

μ and ϵ being respectively the permeability and dielectric constant of the medium surrounding the aerials. Thence

$$R = c \times 10^{-9}\ \text{ohms}$$

where c is the velocity of light in cm/sec. This gives

$$R = 29.979 \text{ ohms},$$

in vacuo, with an error which will probably not exceed one unit in the last place. In air the correct value is about 29·971 at sea level (the values in the table are for vacuo). Now, it is usually considered sufficiently accurate to take R as 30 ohms. This is in error by about 0.7 parts in 1,000. Nevertheless, previous computers have used this rough value to tabulate mutual impedances to accuracies up to a hundred times better than is justified by the initial approximation. Schelkunoff, for example, gives 73·129 ohms as an 'accurate' value of the self-resistance of a half-wave dipole. This implies an error of not more than a half a unit in the third place; i.e., of about 0.007 parts in 1,000. The correct value to this number of decimal places is 73.078 in vacuo (73.059 in air). (a-1, b-2, c-1, d-5, e-0, f-Discussion)

3187. KESSLER, W.J., AND SMITH, S.E., "A Study of Atmospherics Direction Finding and Ranging," Florida U. Engineering and Industrial Experiment Station, Interim rept. 1 September 1950-1 February 1951, TIP No. U18103. See also TIP No. U13729. ABSTRACT: Tests of the ground-pulse direction finder indicated that the general circuitry is adequate for the visual suppresion of displays due to ionospheric reflection. A more complete instruction manual is desirable. Installation and operating instructions are given. Modifications of the set are recommended. Electrical schematics of the ground-pulse direction finder are given. (a-3, b-3, c-1, d-1, e-0, f-Evaluation study. See Abstracts Nos. 2904, 3066, and 3127)

3188. SCHULMAN, J. R., AND DIEHL, E. J., "Radio Compass AN/ARN-17(XA-1), Melpar, Inc., Interim engineering rept., 17 December 1950-16 February 1951, TIP No. U16839. ABSTRACT: Fabrication, wiring, and repackaging of the receiver were completed. The receiver was tightly packed, but the rearrangement of parts allowed for easier servicing and replacement of units. The IF amplifier is plugged into the front panel and held in place by screws. The audio-output unit, crystal filter, interstage crystal transformers, permeability tuner, and RF unit are mounted on the back of the front panel. The main chassis contains the remote tuner, loop control circuit, tone oscillator, BFO, 26.5-vdc and 400-c power supply components and the remote-controlled compass-antenna-loop relay. Tests of the 400-c transformer at 280 c revealed no detrimental effects. A 400-c hum in the first audio stage is being investigated. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3213)

3189. COLOMBANI, A., "Optimum Dimensions of a Stranded-Wire Loop Aerial for Reception," Compt. Rend. Acad. Sci. (Paris), vol. 232, pp. 708-709; 19 February 1951. ABSTRACT: Results of the study of hf resistance of a helical stranded-wire coil are applied. Under the optimum conditions, the rf resistance is twice the dc resistance and is given by an expression independent of the nature of the metal used. The distributed capacitance decreases with the ratio of the volume of coil metal to that of its receptacle; to keep this low the depth of winding may be increased, with corresponding decrease of the length, making the antenna a relatively flat coil of large mean diameter. The signal noise ratio is better for this form than for the antenna form. (a-3, b-1, c-3, d-3, e-0, f-Experimental study)

3190. DIEHL, E. J., "Ground Portable Radio Direction Finder," Melpar, Inc., Interim engineering rept., 1-31 December 1950, TIP No. R4920; 26 February 1951. ABSTRACT: The potted power output stage was satisfactory when tested. Use of a polyester diisocyanate foam potting material appeared to be satisfactory and saved 30% in the weight of the potted units. A 2-mc lattice-type crystal filter is described in detail. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3182)

3191. BUTTS, R.S., "Survey of Electronic Commutation Methods," IRE Convention Record, March 1951. ABSTRACT: Several time-division systems of multichannel radio communication and telemetering have been described in recent papers. In this paper, a comparative analysis is made of several methods of electronic commutation of the signal sources. The analysis is intended to provide a summary of methods to aid the system designer in selecting the most applicable method for a particular system. The analysis includes such factors as speed, sensitivity, cross talk, input power, size, and reliability. Methods included are: thyratron and multivibrator rings, binary-counter-driven matrices, delay lines, polyphase transformers, Scott "T" transformers, and rotary beam tubes. (a-1, b-1, c-1, d-1, e-0, f-Survey and analysis)

3192. CAHN, C. R., AND LE PAGE, W. R., "Signal Resolution in Wide Aperture D/F Systems in the Presence of Noise," Institute of Industrial Research, Syracuse U., Progress rept. no. 3, 1 December 1950-1 March 1951, TIP No. R5784. ABSTRACT: An analytical method of developed for solving the equations resulting from the assumption of quantized antenna patterns requires the solution of a difference equation obtained from the antenna pattern. Solutions were obtained for simple antenna patterns, but more complex patterns require a large amount of computation. Solutions become inaccurate when there are too many asimuth positions. Errors in the measured values of the antenna response are greatly magnified in the calculated solution. An analog computer suggested by the difference-equation method was built and used for the simple patterns. A qualitative analysis based on information theory indicated that resolution below the beamwidth of the pattern is difficult unless the very small high harmonics of the antenna pattern are used. Since noise will usually suppress these small harmonics, resolution below the beamwidth will be difficult when noise is present. Analysis of a solution for only 2 incoming signals indicates that in the presence of noise the effective minimum resolving distance is not much less than the beamwidth. The resolving distance can theoretically be made very small if no noise is present. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract Nos. 3222, 3227, 3252, and 3293)

3193. GORDON, A.N., "The Field Induced by an Oscillating Magnetic Dipole Outside a Semi-Infinite Conductor," Quar. J. Mech. Appl. Math., pp. 106-115; March 1951. ABSTRACT: Formulas are given for the external field produced by an oscillating magnetic dipole located outside a uniform semi-infinite conductor. The normal component of the field induced by a circular alternating filament at the surface of the conductor is also considered. (a-5, b-1, c-1, d-5, e-0, f-Theory)

3194. LESLIE, F.M., "Radiation from Resonant Quarter-Wave Transmission Lines," Wireless Engr., vol. 28, pp. 70-72; March 1951. ABSTRACT: Measured values of the resonant input conductance at 100 Mc/s for three different, balanced transmission lines a quarter-wavelength long are given, the lines being located in either a metal box, or trough, or set at various heights above a metal sheet. (a-5, b-1, c-1, d-5, e-0, f-Analysis, transmission lines)

3195. MEINKE, H.H., "The Behaviour of Curved Uniform Lines at High Frequencies," Arch. elekt. Ubertragung, vol. 5, no. 3, pp. 106-112; March 1951. ABSTRACT: The case of a line bent into an arc of a circle is considered. An equation is derived giving the change of characteristic impedance introduced for a line of arbitrary cross-section. A formula giving a very close approximation is derived for the coaxial line, and some other cross-sections are discussed. The effective length of the line is given by the circumference of a circle whose radius is equal to the mean radius of curvature as particularly defined. For the sake of simplicity, the discussion is restricted to cases in which axial field components may be neglected. (a-5, b-1, c-4, d-4, e-0, f-Theory)

3196. WILLIAMS, C., "Low-Frequency Radio-Wave Propagation by the Ionosphere, with Particular Reference to Long-Distance Navigation," Proc. IEE (London), Part III, vol. 98, pp. 81-99: Disc., pp. 99-103; March 1951. ABSTRACT: A discussion of radio-wave propagation in the 70-300 kc band, with particular reference to the phase or time displacement of the received signal, due to the ionosphere-reflected component. Time-error curves are shown for typical propagation conditions, both for day and night, and at various frequencies. The characteristics of the errors which occur are discussed, and the magnitude of navigational errors arising therefrom are deduced, using suitable examples. From phase and amplitude observations made with receivers in aircraft during both day and night, the relative values of the ground-reflected and the ionosphere-reflected wave components were obtained as a function of distance from the transmitters. The mean height deduced for the reflecting layer is 70 km for daytime and 90 km at night, with corresponding oblique-incidence reflection coefficients of 0.05 and 0.25. Collation of data obtained at fixed receiving points, using Consol, Decca, and Post Office position indicator transmitters, shows that navigational accuracy is improved by making the base-line distances as great as possible. (a-5, b-1, c-1, d-5, e-0, f-Discussion)

3197. CULLAM, JR., A.E., "Factors Affecting Performance of Directional Antennas," Broadcast News, no. 63, pp. 43-51; March/April 1951. ABSTRACT: The horizontal and vertical radiation patterns for various phase and space relations of a two-element antenna show the distribution of the radiation between sky and ground waves. The influence of the shape and bonding of the towers, guy layout, and

insulation and ground screens on the radiation pattern, is considered. Methods of sampling the radiated fields are given. (a-3, b-2, c-1, d-1, e-0, f-Antenna radiation)

3198. ALLISON, J.L., "Direction Finder Data Transmission System," Federal Telecommunication Labs., Inc., Interim engineering rept. no. 3, January-March 1951, TIP No. R5023; April 1951. ABSTRACT: A circuit using 2 HF D/F goniometers was devised to feed 2 D/F receivers from 1 D/F array. A CRT and the dials of several meters connected to receiver no. 1 are photographed as an instantaneous bearing indication; receiver no. 2 feeds an integrator which must integrate the bearings over an appreciable time. The servo system is designed to provide relatively little damping when a new bearing causes a large change in the indication but large damping when there is a fluctuation of a few degrees around an average value. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract Nos. 3183 and 3149)

3199. MACKINTOSH, J.E., "A Description of the American Ground and Airborne Direction Finders AN/CRD-6, AN/URD-4 and AN/ARA-25, for Use on the 400 MEGACYCLE BAND," Royal Aircraft Establishment, Technical Note no. RAD 493, TIP No. R5120; April 1951. ABSTRACT: The descriptions are based on data gathered during a visit to the US in November and December, 1950. It was recommended that RAF equipment be produced similar to the AN/CRD-6. (a-3, b-3, c-1, d-1, e-0, f-Descriptions)

3200. BATEMAN, R., FLORMAN, E.F., AND TAIT, A., "A Source of Error in Radio Phase Measuring Systems," Proc. IRE, vol. 39, pp. 436-438; April 1951. ABSTRACT: When a mobile transmitter was moved between two points over different particular paths around reradiating structures, the measured total phase changes differed by $2\pi n$ radians, where n is an integer. If reradiation from a reflector is of the same order of magnitude as the radiation from an antenna, analysis of the resultant field shows that singularities occur and each traverse of a closed path around a point of singularity gives a total phase change of 360°. (a-5, b-1, c-1, d-1, e-0, f-Reradiation error)

3201. BOWEN, E.G., "Recent Work of the Radiophysics Division C.S.I.R.O.," Proc. IRE (Australia), vol. 12, pp. 99-108; April 1951. ABSTRACT: Developments in radio techniques for meteorology, astronomy, and navigation, are described. A digital computer has been designed and built by the Division to deal with its internal computing requirements. (a-5, b-1, c-1, d-11, e-0, f-Survey)

3202. TAI, C.T., "The Effect of a Grounded Slab on the Radiation from a Line Source," Jour. Appl. Phys., vol. 22, pp. 405-414; April 1951. ABSTRACT: A method of investigation based on Fourier transforms is used. The principal part of the electric field above the dielectric slab can be found either by evaluating the resultant contour integral, using the saddle-point method of integration, or by evaluating the integral containing the tangential H field along the interface. The radiation pattern of the principal field is identical with the field resulting from a direct and a reflected ray, as derived from geometrical optics. When the slab is thick enough to support wave propagation, in addition to the space wave, a surface wave appears in the neighborhood of the interface; the latter attenuates rapidly as the distance from the interface increases. The deformation of the path of integration corresponding to different angles of observation is displayed graphically. (a-3, b-1, c-1, d-1, e-0, f-Reradiation theory)

3203. KESSLER, W.J., ZETROVER, II, W.E., AND OTHERS, "Direction Finding and Ranging on Atmospherics," Florida U. Engineering and Industrial Experiment Station, Final rept. 1 December 1940-31 November 1950, TIP No. U18293; 1 April 1951. ABSTRACT: A single-station location technique based on the analysis of wave forms of atmospherics was investigated. Distance determination through measurement of the time delay between the arrival of ground-propagated and ionosphere-reflected components was only possible at night-time when ionospheric absorption was sufficiently low; only about 2.7% of the wave forms were suitable for time-interval measurements. To avoid ambiguity in distance determinations, either a prior knowledge of the reflecting region or specification of the pulse order of ionospheric returns is necessary. Although the time-interval method does provide a great-circle distance to thunderstorm areas and useful information on the electrical properties of the ionosphere in the VLF range (10-20 kc), it is not regarded as a practical operational method. The ground-pulse direction finder (GPDF) operates on the ground wave alone and eliminates errors due to abnormal polarization of the ionosphere reflected components. The fundamental principles and design considerations leading to the development of a prototype GPDF are given. Ten abstracts of papers which relate to direction finding and ranging on atmospherics are presented. Circuit diagrams of the GPDF components are included. (a-3, b-3, c-1, d-1, e-0, f-See Abstract Nos. 2904, 3066, 3127 and 3187)

3204. DIEHL, E.J., "Ground Portable Radio Direction Finder," Melpar, Inc., Interim engineering rept. 1-31 January 1951, TIP No. R5645, 4 April 1951. ABSTRACT: The general coil design of the RF section was completed. Data are presented for the sense antenna, loop antenna, oscillator, and RF coils. The dial and tuning mechanism is illustrated and described. Crystal filter packaging was redesigned, and the form factor of the filter units was changed in keeping with the over-all packaging requirements. (See also TIP R5239.) (a-3, b-3, c-1, d-1, e-0, f-Descriptive report. See Abstract Nos. 3182 and 3190)

3205. SCHOEBERLEIN, W., "Ultra-Short-Wave Direction-Finding Installation PV-1B," (Direction-Finding Installation at Kloten Airport); Bull. schweiz. elektrotech. Ver., vol. 42, pp. 226-232; 7 April 1951. ABSTRACT NO. 1: Outline of the principles of operation and features of the single-receiver automatic system in operation since 1949 [see 1378 of 1949 (Cleaver)]. Sources of error in the Adcock fixed-antenna system are briefly discussed. Remote indication introduces an error of not more than 1 percent. ABSTRACT NO. 2: A review of the theory of the Adcock system, including the angular and frequency dependence of octantal errors, is followed by an illustrated description of the equipment at Kloten. C.r.t. display is provided the N-S aerial output being modulated at 5 kc/s and the E-W at 6 kc/s before passing through a common receiver, which is followed by separate phase-sensitive detectors. The instrument error does not exceed 2° over 116-135 Mc/s. (a_1-5, a_2-5, b-1, c-4, d-13, e-0, f-Survey)

3206. DIEHL, E.J., "Ground Portable Radio Direction Finder," Melpar, Inc., Interim engineering rept. 1-28 February 1951. TIP No. R5646; 9 April 1951. ABSTRACT: Measurements on the 1E8 tube for the RF mixer stage showed that the signal grid has little effect on total tube current and conversion gain. For optimum operation the total tube current was about 2 ma and the conversion gain, including IF transformer losses, was 3.6. With the RF grid biased to -1.5 v, the oscillator injection voltage required for maximum conversion gain was reduced by a factor of 2, from about 19 to 8 vrms. Measurements on a power output stage showed that 2 Raytheon-type 5672 tubes connected in parallel would directly replace a QF721 output tube at the expense of 40 ma more filament power, higher distortion, and greater driving voltage. If 5672 tubes must be used, the potted plug-in power output stages will be interchangeable without modifications in the receiver wiring. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract Nos. 3182, 3190 and 3204)

3207. TAYLOR, J., "The Sleeve Antenna," Cruft Laboratory of Harvard University, Technical Report No. 128, TIP No. U18886; 20 April 1951. ABSTRACT: In the investigation of the center-driven antenna several theoretical approaches to the problem and many experimental techniques were developed. It is the purpose of this research to apply some of these methods to a more complicated structure. Two structures slightly more complicated than the center-driven dipole which have not been thoroughly investigated up to the present are the sleeve antenna and the asymmetrically driven antenna. The asymmetrically driven antenna, while no more complicated than the sleeve antenna from a theoretical point of view, has a serious disadvantage from the experimental standpoint. This is due to the fact that the structure possesses no neutral plane of symmetry so that the transmission line to the antenna always forms a major part of the radiating system unless the antenna is driven by an internal generator. On the other hand, the sleeve antenna, although it contains two driven points, is symmetrically fed. Therefore, the transmission line to it can be put in a neutral plane, or the structure can be cut in half and mounted over an image plane. For this reason the sleeve antenna was chosen for the subject of the present investigation. The sleeve antenna has many practical applications so that a study of the electrical properties of the structure is justifiable on this ground alone. Mechanically, it is a very simple structure and can be ruggedly constructed without any interference with its electrical characteristics. It has an advantage over the center-drive dipole in that there are two lengths (total length and sleeve length) and two radii which can be used as design parameters. In addition, the section of transmission line formed by the sleeve and inner conductor can be used as an impedance transformer to obtain a better match between the antenna and the transmission line. These five parameters permit the design of sleeve antennas with broadband impedance characteristics. The discussion of the sleeve dipole falls into four parts. In Part 2 the problem is treated theoretically by a variational principle and the Ritz method is applied to obtain approximate solutions to both the input impedance and the distribution of current on the structure. Part 3 contains a detailed description of the measuring apparatus and a discussion of the methods of measure-

ment. Part 4, experimental data are discussed, and Part 5 contains a comparison of the theoretical and the experimental results. (a-1, b-3, c-1, d-1, e-234, f-Description)

3208. EGGERTON, W.H. AND DIEHL, E.J., "Ground Portable Radio Direction Finder," Melpar, Inc., Interim engineering rept. 1-31 March 1951, TIP No. R5239; 24 April 1951. ABSTRACT: Input and output transformers were designed for operation with the IF crystal filters. Tuned-circuit capacitors are contained within the cans and the coil which is coupled to the filter is slug-tuned to permit an impedance match with the filter. Trimmers in the crystal filter are used for resonance tuning. Power-output units were assembled for potting with polyester diisocyanate foam. The battery supply is to be attached to the rear of the receiver in a Fiberglas container because of the questionable reliability of the Silvercels. Small lightweight heating units fueled by lighter fluid are being investigated to determine if the heat output is sufficient to maintain the batteries above 0°C. Combustion of the vapors without flame provides heat at a rate controlled by the 0 supply. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3190)

3209. ANONYMOUS, "Radio on the Airways," Wireless World, vol. 57, pp. 199-202; May 1951. ABSTRACT: A general description of mf omnidirectional beacons and radio ranges, and also vhf marker beacons, as used on the main air routes in Great Britain. The beacons and radio ranges, operating in the 200 to 400 kc band, provide airway entrance markers and 4-direction course indication, respectively. Position information is given by the vertically radiating vhf marker system. (a-3, b-1, c-1, d-5, e-0, f-Description)

3210. RAFF, S.J. "Reflecting Surface to Simulate an Infinite Conducting Plane," Jour. Appl. Phys., vol. 22, pp. 610-613; May 1951. ABSTRACT: A finite reflecting surface, which simulates an infinite plane, is required for calibrating measurements of reflections back to a microwave transmitting antenna. The Fresnel-zone method of physical optics is used for the design calculations. Variational calculus is used to determine the optimum reflector shape for a given antenna pattern, reflector size, and range of antenna-to-reflector distance. Theoretical values are compared with results obtained on an example constructed for use at 25λ from a dipole antenna. (a-5, b-1, c-1, d-1, e-0, f-Measurements)

3211. STANNER, W., "Radio Direction Finding from the Morphological Viewpoint," Elecktron, (Garmisch), vol. 5, pp. 135-176; May 1951. ABSTRACT: A comprehensive review of the subject dealing with (a) arrangements for directional reception of medium, long, and ultrashort waves, (b) arrangements for directional transmission, (c) the consol system, (d) various methods of distance measurements, (e) radar equipment, (f) anti-radar methods, (g) geophysical and astrophysical problems of radio D/F. (a-3, b-1, c-4, d-4, e-0, f-Survey)

3212. KILPATRICK, E.L., AND SILBERSTEIN, R., "A Technique for Phase Measurements on Pulsed Radio-Frequency Signals," National Bureau of Standards, 15 May 1951. TIP No. U18666. ABSTRACT: A detailed description and circuit diagrams are presented of an instrument for phase measurements of pulsed RF signals. The system employs 4 antennas and 2 receiving channels (each channel being associated with a pair of aerials) to yield the apparent vertical and horizontal angles of arrival, and information on variations in the phase front for a single or multiple arriving wave. The 2 RF signals in each channel are heterodyned to an IF and then combined in a sum-and-difference amplifier. The resultant sum-and-difference voltages are shifted 90° in relation to one another by means of a goniometer and put on opposite pairs of plates of a CRO for phase indication. The CRO presents an ellipse whose major axis is tilted away from a line joining the centers of 1 pair of lines by half the phase angle. Voltages proportional to the original RF inputs are also displayed for amplitude indication. All 4 oscilloscope faces may be recorded on 1 frame of 35-mm film. Alignment of the channels is accomplished by a technique of separately disabling each channel ahead of the sum-and-difference amplifier and producing a circle which may be adjusted visually. Errors in this adjustment are not serious but the system is very sensitive to frequency shifts of the local oscillator or the transmitter. An appended theoretical analysis of errors in phase measurements indicated that the accuracy of these values is about 2% of phase, but drifts may cause errors of 5% or more. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3087)

3213. SCHULMAN, J.R., AND DIEHL, E.J., "Radio Compass AN/ARN-17(XA-1), Melpar, Inc., Interim engineering rept., 17 February -16 April 1951, TIP No. U18144; 22 May 1951. ABSTRACT: Excessive 400-cps hum was eliminated from the audio output of the receiver by burn-in of the first audio amplifier tube; hum modulation was dispensed with by (1) redesign of the AVC filter and (2) shifting the operating point of the mixer tube to a more linear portion of the characteristics curve. Redesign of the crystal filter transformer reduced the loss through the filter by 16 to 1. Alignment of the RF-amplifier and oscillator-tuned circuits revealed mistracking on band 4. The difficulty was eliminated by cutting non-linear threads for the oscillator and high-RF coils on band 4 and adding shunt and series padding coils to obtain 3-point local-oscillator tracking on band 3. The local oscillator circuit was redesigned to incorporate the new units and to increase the strength of oscillations at the high end of band 4. After redesign, tracking between the RF amplifier and local oscillator was within 1.2 db on all bands. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3188)

3214. HUERTA, A.F., "Travelling-Wave Aerials," Rev. Telecom. (Madrid), vol. 6, pp. 23-37; June 1951. ABSTRACT: Refers generally to wavelengths of 10-100 m. The theory is given and practical examples are worked out, which include aerials of a conventional rhombic type and also of a type suggested by the author. It is claimed that the latter, consisting of a group of four parallel horizontal conductors, gives a gain comparable with that of the rhombic but occupies less space. (a-2, b-1, c-5, d-18, e-0, f-Experimental analysis)

3215. JORDAN, E.C., "Antenna Systems for Radio Direction Finding," Proc. IRE, vol. 39, pp. 716-720; June 1951. ABSTRACT: A brief summary is made of antenna systems useful for radio direction finding. The characteristics of systems both small and large in wavelengths are considered. Methods of antenna synthesis are described that will yield narrow beam patterns and optimum patterns for linear and circular arrays. Problems peculiar to radio-direction finding antennas in the low-frequency, medium-frequency, and high-frequency bands are reviewed and some of the solutions obtained are indicated. (a-2, b-1, c-1, d-1, e-0, f-Summary)

3216. RUNGE, W., STROHHACKER, M., AND TROOST, A., "'Telegon' Direction Finder," Telefunken Ztg., vol. 24, pp. 75-81; June 1951. ABSTRACT NO. 1: Description of Telefunken equipment for ships, with a wavelength range of 85 to 1,530 m. Circular crossed coils 110 cm in diameter, together with a vertical rod 2.6 m long and coincident with the common diameter of the coils, constitute the antenna system. The special features of the Type E-374N receiver are described, and a simplified circuit diagram is given. The total frequency range is covered in four ranges with adequate overlap. ABSTRACT NO. 2: A brief historical survey is given of direction-finding development for ship navigation on medium and long waves. The latest Telefunken D/F equipment uses fixed loops once more and a goniometer, the latter being of the iron dustcore type. A short theoretical explanation of the principles of D/F is presented, and the "Telegon" equipment is then described and illustrated by photographs. The loops are mounted in light metal tubes of 1.1 m diameter and connected via a screened cable to the miniature goniometer, which serves at the same time as a step-up transformer. The voltage gain in the aerial to first grid circuit is 100. The bandwidth of the receiver is adjustable between ±450 c/s and ±12 kc/s. (a_1-3, a_2-5, b-1, c-4, d-4, e-0, f-Survey)

3217. SCHOTT, F.W., "On the Response of a Directive Antenna to Incoherent Radiation," Proc. IRE, vol. 39, pp. 677-680; June 1951. ABSTRACT: A general expression is derived for the power gain of a directive antenna over a nondirection antenna, when receiving radiation comprising components with various directions of arrival and random phases. The usual method of expressing signal strength in db relative to a particular µv/m level may give rise to error in this case; only the received power can be stated. Results obtained by measurement with parabolic antennas at 9.375 kmc show that for widely scattered radiation the antenna aperture has little effect on received power. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3218. TROOST, A., AND JANKOVSKY, R., "Recent Goniometer Developments," Telefunken Ztg., vol. 24, pp. 81-85; June 1951. ABSTRACT: Improvements in goniometer design resulting from the use of iron-cored rotors, iron rings, and shields, are reviewed, and a description is given of the goniometer used in the Telegon receiver Type-E374N. This is of the iron-shielded type with a high-µ rotor core which gives the requisite inductance of the windings with a relatively small number of turns. The residual bearing error is < 0.15°. Methods of test are outlined. (a-3, b-1, c-4, d-4, e-0, f-Review - goniometers)

3219. BRAMLEY, E.N., "Measurement of Direction of Arrival of

Short Radio Waves Reflected at Ionosphere," Proc. Roy. Soc., vol. 207, no. 1089, pp. 251-267; 22 June 1951. ABSTRACT: Data on direction of arrival of waves reflected at ionosphere during normal daytime conditions, both over oblique path and at nearly vertical incidence; pulsed signals used at 4-15 mc; work was mostly on first order F-layer reflections where echo exhibits both rapid fluctuations in direction and slow changes of quasi-period of several minutes. Bibliography. (a-3, b-1, c-1, d-5, e-956, f-Polarization)

3220. ALLISON, J. L., "Direction Finder Data Transmission System," Federal Telecommunication Labs., Inc., Interm engineering rept. no. 4, April-June 1951, TIP No. R5806; July 1951. ABSTRACT: The teletype system for transmitting azimuth data, including a Ketay precision resolver operated by a phase-measuring servo amplifier, is described. The shaft of the resolver reproduces the phase of a noise-free signal to better than 1/4°; for any practical signal from a cardioid-pattern D/F system, the shaft will reproduce the phase of the output signal to better than 1/3°. A signal-decoding method was developed which will cause a shaft at the receiver to reproduce the position of the shaft at the transmitter once every 5 sec. The received teletype signal will throw a bank of relays to reproduce the positions of the relays at the transmitter which are actuated by photoelectric cells. Improvements in the antenna-coupling circuits eliminated undesirable interactions. A motion-picture camera was adapted to make 30 exposures/min. (a-3, b-3, c-1, d-1, e-0, f-Description)

3221. ROSS, W., BRAMLEY, E.N., AND ASHWELL, G.E., "A Phase-Comparison Method of Measuring the Direction of Arrival of Ionospheric Radio Waves," JIEE, Part III, vol. 98, pp. 294-302; July 1951. ABSTRACT: The most convenient research method of measuring completely the direction of arrival of waves reflected at the ionosphere appears to be that in which the phase differences of the signals received in an assembly of aerials are measured. If two pairs of similar aerials erected on lines perpendicular to each other are used, two independent phase angles may be obtained from which both angle of elevation and azimuth may be deduced. The apparatus described used spaced coaxial loop aerials at a separation of 100 m. The signals from the aerials in a pair are amplified by means of matched receivers. The phase difference between the output signals from these receivers is displayed direct on a cathode-ray tube as the angle of inclination of the trace. With pulsed signals emitted from a suitable transmitter and with corresponding timing equipment in the receiver, the individual rays making up the total ionospheric signal may be separated from each other. The apparatus the frequency band 4-15 Mc/s, and the rms error of phase measurement is about 1°. Site errors, however, set a more severe limit to the accuracy of the directional measurements than do instrumental errors, and in practice it is found that, for example, over an oblique path corresponding to a range of 700 km, bearings can be measured with an accuracy of about 1° while the angle of elevation can be measured with an accuracy better than about 1-1/2° so long as it exceeds 30°. These limitations mean that angles of elevation of E-layer reflections cannot be measured accurately at long range; it is possible, however, to obtain measurements of useful accuracy of the angle of elevation of F-layer reflections at ranges up to 1000 km or more. Bearings can be measured accurately at all ranges and for all reflections. The apparatus has so far been used principally for the study of F-layer reflections. (a-1, b-1, c-1, d-1, e-909, f-Theory)

3222. LE PAGE, W. R., THAYER, W., AND BROWN, J.S., "Signal Resolution in Wide Aperture D/F Systems in the Presence of Noise," Institute of Industrial Research, Syracuse U., Progress rept. no. 4, 1 March - 31 May 1951, TIP No. R5780; 1 July 1951. ABSTRACT: Laboratory tests were made of 2 high-Q circuits, LC and RC networks with positive feedback, to obtain information of their stability. Q values in the thousands were obtained, but reasonable stability was achieved only when Q was of the order of a few hundred. The RC circuit showed less long-term drift than the LC circuit. Better stability might be possible with temperature-controlled elements. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract Nos. 3192, 3227, 3252, and 3293)

3223. TESTS, C., "Radar Search Central AN/TPQ-1A," Signal Corps Engineering Labs, TIP No. R5380; 1 July 1951. ABSTRACT: The modified AN/TPQ-1A constitutes a radar search, analysis, and direction finding system having a frequency coverage of 40 to 6000 mc. Serious limitations exist in the search function because of lack of sensitivity, poor image rejection, and inability to reject spurious responses of radar receivers R-111/APR-5A and R-54/APR-4. Antenna characteristics exhibited deficiencies due to the inherent incompatability of the requirements for high antenna gain together with omnidirectional coverage. (a-3, b-3, c-1, d-1, e-0, f-Description)

3224. ANONYMOUS, "Antenna Research and Development," Antenna Lab., Ohio State U. Research Foundation, Interim engineering rept. for period ending 30 June 1951, TIP No. U19405. See also TIP No. U18756; 2 July 1951. ABSTRACT: Panoramic impedance measurements: Another frequency combination was selected for the frequency changer to avoid trouble caused by harmonics. The most desirable fixed frequency was 2650 mc. A satisfactory circuit was developed for the first mixer of the frequency changer operating at 800 mc. With minor adjustments, it will work equally well with a fixed frequency of 2650 mc. The operation of the broadband-pass filters was analyzed. Preliminary tests of the directional loops gave good results. A model of the continuous-type phase shifter and the amplitude servo were completed. Antenna polarization parameters: The form of the reflection matrix is theoretically considered when 2 arbitrary orthogonal, elliptically polarized reference vectors are used instead of linear vectors. Variations of the reflection and admittance matrices with rotation of coordinates is discussed, and the linear dipole or probe is described. The reflection matrix is unitary for total reflection of power from a reflector. A lossless receiving antenna with a load that is purely reactive is a special case. Polarization of the wave transmitted from an aperture excited by a wave guide is considered as a function of the length of the guide, the reflection matrix of the aperture, and the admittance matrix of the antenna used to excite the guide. Efficiency measuring equipment: The nodding rotator for the LF system was put into operation. The impedance characteristic of a detector from the 3-cm wave-guide array was studied. (a-3, b-3, c-1, d-1, e-0, f-Report)

3225. ANONYMOUS, "Operational Test of ID-250/ARN Indicator with AN/ARN-6 Radio Direction Finder Equipment," Naval Air Test Center, Patuxent River, Final rept. 27 July 1951, TIP No. U18544. ABSTRACT: Laboratory tests were conducted to determine whether the directional pointers of the ID-250/ARN indicator, designed to operate from a 26.5-v 400-cps ac source, would be actuated properly by the AN/ARN-6 direction-finder equipment, whose output voltage and frequency are approximately 12.5 v and 100 cps, respectively. Pointer accuracy was within satisfactory limits. Temperature measurements on the ID-250/ARN in a simulated aircraft installation showed a rise of only 2°C after 8 hrs of continuous operation. Recommendations are made for the correction of drawing 51A2H32. (a-3, b-3, c-1, d-1, e-0, f-Test report. See Abstract Nos. 3243 and 3273)

3226. HANSEL, P.G., "Polarization Errors of Radio Direction Finders, a Proposed Classification," Proc. IRE, vol. 39, p. 970; August 1951. ABSTRACT: Primary instrumental polarization errors are defined to be those which arise when the response of the antenna system to an "unwanted" primary component of the received wave is large. "Secondary polarization errors" are those which arise when the antenna does not respond to the primary "unwanted" component, but takes a bearing on reradiated waves polarized in the "wanted" direction. (a-1, b-1, c-1, d-1, e-0, f-Polarization)

3227. LE PAGE, W.R., AND BROWN, J.S., "Signal Resolution in Wide Aperture D/F Systems in the Presence of Noise," Institute of Industrial Research, Syracuse U., Progress rept. no. 5, 1 June - 31 August 1951, TIP No. U24225. ABSTRACT: Work on the high-Q filters using feedback was terminated temporarily with a series of tests to determine the stability attainable for the resonant frequency. At a Q of 360, frequency drifts of the order of 4.5 parts per 1000 were attainable. The difficulty of obtaining high stability led to an investigation of a synchronous filter in which the filtering action is attained by producing a charge distribution on a bank of capacitors through the action of a rotating brush driven in synchronism with the applied signal. The results indicate that such a system can be made to have a response function for which the magnitude and phase angle functions, F and θ, respectively are:

$$F = \frac{1}{\sqrt{1 + \frac{2h}{(1-h)^2}\left(1 - \cos 2\pi \frac{f}{f_r}\right)}} \quad \text{and}$$

$$\theta = -\tan^{-1}\left(\frac{h \sin 2\pi \frac{f}{f_r}}{1 - h \cos 2\pi \frac{f}{f_r}}\right)$$

The h is a system parameter very nearly 1, and f_r is the frequency of rotation of the brush which produces the signal on the bank of capacitors. This response function is periodic in f, having peaks at multiples of f_r. With larger values of h, the peaks become sharper. The parameter h is a function of the time constant of one of the capacitors taken with the resistor through which it charges. The width of one of

the response bands to the half-power points, in cps, is given approximately by

$$\text{Bandwidth} = \frac{f_r}{\pi}(1 - h).$$

(a-3, b-3, c-1, d-1, e-0, f-See Abstract Nos. 3192, 3222, 3252, and 3291)

3228. GATES, R.F., AND LE PAGE, W.R., "A Study of Directional Antenna Systems for Radio D/F Purposes," Institute of Industrial Research, Syracuse U., Final rept. 15 September 1949-15 September 1951, TIP No. U24226. ABSTRACT: In order to give further insight into the operation of the Wullenweber antenna array over a specified frequency bandwidth, theoretical pattern computations are presented in the form of a series of plotted patterns for 2 basic arrays. Both arrays have the same diameter (8λ at the center frequency) but different element-to-reflector spacings (1/4 and 1/8λ). A discussion on the antenna feed system is presented in terms of the transmitting condition. Four possible methods of obtaining the desired amplitude distribution along with proper phasing are treated. Considering that the same current distribution in each case, result in the same radiated power, the power input is found and used as a basis for comparison. The relative effectiveness of each system for the receiving condition is indicated by a comparison of the relative effective heights as computed from power relations under transmitting conditions. An extension of the reciprocity theorem to arrays having dissipative members show that reciprocity still holds under certain qualifying assumptions. The commutator was assembled, and SWR'S were measured to determine the effect of the brushes and commutator segment contact on the continuity. The results indicate that the discontinuities were reasonably small. (a-3, b-3, c-1, d-1, e-0, f-Study. See Abstract Nos. 2967, 3111, and 3130)

3229. MOON, J.H., "The Calibration of Aircraft Direction Finders with Particular Reference to Site Selection," Marconi Rev., vol. 14, pp. 101-112 3rd Quarter 1951. ABSTRACT NO. 1: Experiments are described which show that radio waves are refracted as the pass over reinforced-concrete runways. Errors were observed on a loop direction finder at frequencies between 200 and 700 kc, with waves incident horizontally at an angle of 50° to the line of the runway. The maximum error was about 6° at the edge of the runway and 1.5° at a distance of 100 feet from it. ABSTRACT NO. 2: Since increasing number of unusual irregular errors have been encountered in calibration of airborne direction finders, it is emphasized that care is necessary in selecting suitable calibration site; origin of irregularities; some of them are due to diffraction of radio waves by reinforced runways, buried cables and similar causes. (a_1-3, a_2-3, b-2, c-1, d-5, e-0, f-Description)

3230. RUST, H. H., "Rotating Radio Beacon with Angle-Dependent Frequency for Position Finding," Arch. elekt. Ubertragung, vol. 5, pp. 421-424; September 1951. ABSTRACT: A position-finding system designed for maximum ease of operation on board ship or aircraft uses a rotating beacon in which either carrier or modulation frequency is a function of angle, so that every direction of radiation is associated with a definite frequency. With two such beacons at a suitable separation, position can be determined without ambiguity. (a-3, b-1, c-4, d-4, e-0, f-Description)

3231. WALSH, J. E., "Radiation Patterns of Arrays on a Reflecting Cylinder," Proc. IRE, pp. 1074-1081; September 1951. ABSTRACT: Simple approximate formulas are derived for the horizontal and vertical patterns of directional arrays of dipoles arranged on an arc of a circle or on the surface of a right circular cylindrical segment and backed by a reflecting cylinder. The dipoles may be aligned axially or circumferentially and the amplitude distribution on them may be uniform or cocinusoidal. The results are valid in the vicinity of the radiation maximum, but are less certain at wide angles unless the dipole spacing is substantially less than a half wavelength. It is found that the array patterns compare favorably with those of linear arrays of comparable dimensions and similar amplitude distributions, and that there exists, in certain cases, an increase in gain over the linear array brought about by the end-fire effect inherent in the geometry of the circle. (a-1, b-1, c-1, d-1, e-3, f-Experimental analysis)

3232. WELLER, RALPH K., "An Alternate Least Squares Solution for Determination of Position from Radio Doppler Data," Ballistic Research Labs., Aberdeen Proving Ground, TIP No. U19833; September 1951. ABSTRACT: A least squares solution is presented for determining position from radio Doppler data by the method of steepest descent. The use of this solution on high-speed computing machines appears feasible. (a-3, b-3, c-1, d-1, e-0, f-Theory. See Abstract No. 3255)

3233. YARU, N., "A Note on Super-Gain Antenna Arrays," Proc. IRE, vol. 39, pp. 1081-1085; September 1951. ABSTRACT NO. 1: Numerical calculations have been made for linear broadside super-gain arrays. Using arrays having an over-all length of a quarter wavelength as an example, it is shown that as the required directive gain is increased, tremendous currents are required to produce only a small radiated field. For a 9-element array which produces a power gain of 8.5, the currents must be adjusted to their correct value to an accuracy of better than 1 part in 10''. The efficiency is less than 10^{-14} per cent. ABSTRACT NO. 2: Calculations for linear broadside direction finding type arrays; using arrays of 1/4 wavelength oa, it is shown that as required directive gain is increased, tremendous currents are required to produce only small radiated field; for 9-element array which produces power gain of 8.5, currents must be adjusted to correct value to accuracy better than 1 part in 10^{11}. (a_1-1, a_2-3, b-1, c-1, d-1, e-0, f-Analysis)

3234. DU HAMEL, R. H., "Patterns and Impedances of an Antenna near a Conducting Cylinder," Electrical Engineering Research Lab., U. of Illinois, TIP No. U20272; 1 September 1951. ABSTRACT: Equipment was built for measuring the amplitude patterns at 3000 mc. on a model antenna. Field patterns are presented for 5 cylinders ranging in diameter from 1 to 4 λ; the spacing of the antenna from the cylinder was varied from λ/16 to λ. Theoretical and experimental patterns were compared for 2 different cases of cylinder diameter and dipole spacing. The maximum difference between the calculated points and the measured pattern was less than 3% of full scale reading. The results of the measured self and mutual impedances of antennas near a 1.46- λ-diam. cylinder indicated that the impedance may be calculated to a good approximation by assuming that the effect of the reflecting cylinder is the same as that of an infinite reflecting plane. (a-3, b-3, c-1, d-1, e-0, f-Experimental analysis)

3235. ANONYMOUS, "D/F Signal-to-Noise Improvement Unit," Engineering Research Associates, Inc., Interim Engineering Rept., 5 July-5 October 1951, TIP No. R5773. ABSTRACT: An experimental model of a unit to improve the S/N ratio of 30-, 45-, or 150-c. signals from a crash locator beacon uses 60 c. for convenience. Received signals are recorded on a rotating magnetic storage drum at 20 sweeps of the antenna per revolution. Playback heads are spaced so that 16 consecutive sweeps are scanned simultanesouly, each by a separate playback head. The heads are connected so that the corresponding signals from the 16 scans are added. The desired signal is thus enhanced while the noise components, being random, are reduced in the combined output. Tests with a breadboard setup indicated successful S/N improvement. Regenerative circulation tended to deteriorate wave form but may be advantageous for extremely weak signals. Temperature-humidity tests promised satisfactory operation of the potted preamplifier and the red oxide recording medium. A portion of a paper on variable boundary magnetic recording is appended. (a-3, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 3299)

3236. ALLISON, J. L., "Direction-Finder Data-Transmission System," Federal Telecommunication Labs., Inc., Interim Engineering Rept. No. 5, July-September 1951, TIP No. R5805; October 1951. ABSTRACT: Details of circuits worked out for the transmitting and receiving ends of the system are described. Signals are being recorded on film for correlation studies. Signals were received from an Air Force low-powered beacon transmitter which may be used with this system. (See also TIP R5023.) (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3198)

3237. BENKLEY, F. G., WILLIAMS, H. M., AND OTHERS, "Multisignal UHF Direction Finder," Melpar, Inc., Interim Engineering Rept. Nos. 1-4, 14 June-13 October 1951, TIP No. R5772. ABSTRACT: The engineering model of this D/F for 225 to 400 mc. will comprise a Wullenwever-type antenna, commutating system, radio receiver, and indicator unit for displaying the signal pattern on a CRT. The scan rate is to be at least 600 (preferably 1800) rpm and the system should be able to indicate the bearing of all signals on a given frequency that are separated by 15° or more in azimuth and differ in level by no more than 20 db. Frequency response tests indicated that a 5HCT synchro will be satisfactory as a rotary transformer. A breadboard of the indicator unit is nearly complete. (See also TIP U19553, U13918.) (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3272)

3238. GARDINER, P. C., "Checking Calibration of Loop Antennas," Electronics, vol. 24, pp. 140, 142, 244, 248, 250; October 1951. ABSTRACT: The spaced loop method of laboratory calibration of field-strength meters used by the Nat. Bur. of Standards is outlined

and the emf equation given. The disadvantages of this method are: the cleared space required, accurate measurement of loop spacing, and the need for a transmitter and thermocouple meter. If the primary loop is placed concentrically within the receiving loop, exact positioning is unnecessary and a simple jig may be used. The primary loop is fed by a signal generator. A formula is given from which the field strength may be calculated in terms of the radius of the receiving loop and the voltage induced in it, which may be measured directly. Only a small screened room is needed in which to make the measurements. (a-2, b-2, c-1, d-1, e-0, f-Calibration technique)

3239. HOFFMANN, E. A. G., "Calculation of the Radiation Pattern of a Rhombic Aerial with Arbitrary Terminating Impedance," Funk u. Ton., vol. 5, pp. 518-525; October 1951. ABSTRACT: Gives the detailed calculation of the vertical polar diagram by the vector potential method, assuming the current distribution along the rhombics to be the same as that along a uniform loss-free mismatched transmission line. It is shown that mistermination can be useful in reducing the amplitude of the backward lobe in particular cases. (a-2, b-1, c-4, d-4, e-0, f-Rhombic antennas)

3240. HOPKINS, H. G., AND HORNER, F., "Rotating H-Type Adcock Direction-Finders for Metre and Decimetre Wavelengths," Proc. Instn. Elect. Engrs., PT. IV, pp. 98, 112-126; October 1951. ABSTRACT: Discusses from a theoretical standpoint the main factors influencing directional accuracy and sensitivity such as unwanted couplings, aerial unbalance, receiver screening and mechanical accuracy of the aerial system. A description of various D/F systems in the range 26-600 Mc/s is given with diagrams of their mechanical construction and layout. A summary of characteristics of these D/F systems is given together with polar diagrams and curves of polarization errors. Mathematical analysis in an appendix shows the error introduced by coupling between the transformer and the transmission line, also a method of measuring the total polarization error. (a-2, b-1, c-1, d-5, e-0, f-See Abstract No. 3275)

3241. STRINGER, F. S., AND CROPPER, E. W., "An Account of Experiments on the Comparative Performance of Suppressed and External Loop Aerials for the British Radio Compass (A. R. I. X303A)," Royal Aircraft Establishment (Gt. Brit), TIP No. U21919; October 1951. ABSTRACT: Ground and air-borne observations were made to determine the effect of using a suppressed loop aerial instead of the external loop aerial on the performance of the automatic direction finder A. R. I. X303A in the presence of sky wave. Quadrantal errors of an aircraft were appreciably increased by the introduction of the suppressed loop, especially at frequencies approaching 1 mc. The daylight bearing errors of the suppressed loop were small and similar to those of the external loop when signals were greater than the threshold values and when site errors were considered. The errors at night when sky wave was present were, in general, greater for the suppressed loop but the increase in standard deviation was not greater than 1.3. The pickup factor for the external loop was approximately 2.5 times that for the suppressed loop in 2 test flights. When the quadrantal errors were calibrated out, the effects that persisted for the suppressed loop were a decrease in the maximum range of operation by day and night and a slight increase in the random error at night due to the ionosphere reflected wave. (a-3, b-3, c-1, d-5, e-0, f-Evaluation test report)

3242. VASSY, E., "Disturbances Caused by the Atmosphere in Aids to Navigation," Onde Elect., vol. 31, pp. 379-383; October 1951. ABSTRACT: Sources of error in direction-finding systems are discussed generally, including the effects of tilts and asymmetry in the higher ionized layers, and of lateral refraction and diffuse reflection in the troposphere. (a-3, b-1, c-3, d-3, e-0, f-D/F error)

3243. BOWEN, JR., J. B., "Laboratory Test of AN/ARN-6 Direction Finder," Naval Air Test Center, Patuxent River, Final Rept., TIP No. U19722; 31 October 1951. ABSTRACT: The direction finder was tested to determine the adequacy and accuracy of BuAer drawings 51A2D39 and 51A2H40. The drawings will be acceptable when corrected as indicated. (a-3, b-3, c-1, d-1, e-0, f-See Abstract Nos. 3225 and 3273)

3244. KNUDSEN, H. L., "The Necessary Number of Elements in a Directional Ring Aerial," J. Appl. Phys., vol. 22, pp. 1299-1306; November 1951. ABSTRACT: It is shown that an odd number of elements is more favourable than an even number in approximating the array characteristic of a similar ring aerial with infinitely many elements. It was previously shown by Page that a similar statement applies to an azimuthly omnidirectional, fading-reducing, concentric ring aerial; this result is contained as a special case in this investigation. The present paper deals especially with the case in which the principal direction of the aerial array is horizontal; the theory is illustrated by a numerical example. (a-2, b-1, c-1, d-1, e-0, f-Analysis)

3245. MOLINE, J., "Accuracy in Electromagnetic Distance Measurement," Radio Franc., no. 11, pp. 1-5; November 1951. ABSTRACT: Principles of pulse, FM, and phase-displacement methods of distance measurement by means of em waves reflected from the distant point are outlined, including that combining pulse and phase measurement. In phase-displacement systems accuracy to within $\lambda/100$ is attainable for frequencies up to 30 mc. (a-3, b-2, c-3, d-3, e-0, f-Measurement)

3246. POLYDOROFF, W. J., "Ferromagnetic Loop Antennas," Radio-Electronic Engng., vol. 16, pp. 11-13, 24; November 1951. ABSTRACT NO. 1: Spaced-turn solenoids wound on cylindrical cores of ferrite material may be used to replace the circular loops hitherto used for direction finding, with considerable reduction in size and drag when used in aircraft. The open type of core picks up magnetic lines of force in space and it is found that cores with large ratios of length to diameter give greater effective heights. ABSTRACT NO. 2: From results on loops with ferrite cores it is concluded that, in their design; (a) a balance must be struck between an acceptable value of Q and maximum effective permeability, a Q of 125-150 being considered most suitable; (b) cylindrical cores of length/diameter ratio to give greater effective height; (c) the winding should cover 80% of the core length; (d) the wire, if insulated by vinylite or double cotton covering, may be wound directly on the core; (e) the core should be in the shape of hollow tubing. Various applications where reduction in aerial size is important are suggested. (a_1-2, a_2-3, b-2, c-1, d-1, e-453, f-Ferromagnetics)

3247. TRUE, V., "An Automatic Antenna Tuner for a 35-Foot Whip Antenna," NRL Report 3888. See also Department of Commerce PB106129; November 1951. ABSTRACT: An automatic antenna-tuning unit has been constructed to match the input impedance of a 35-foot whip antenna to a 50-ohm coaxial line over the frequency band of 2-26 Mc. This unit has been designed specifically to accommodate a transmitter with an output power of the order of 500 watts. This unit has been tested in breadboard form and found to operate satisfactorily. On the basis of laboratory tests to date two conclusions are reached: (1) this unit and some variations of it show definite promise of improving the dependability of communications systems employing whip antennas which are relatively short, and (2) modifications of this system have a range of application, efficiency, dependability, and life expectancy limited primarily by the physical and electrical characteristics obtainable in matching unit components. (a-3, b-3, c-1, d-1, e-0, f-Description)

3248. ANONYMOUS, "Analysis and Measurement of Antenna Parameters," Antenna Lab., Ohio State U. Research Foundation, Final Engineering Rept., vol. 3 on Antenna Research and Development, September 30, 1950-October 31, 1951, TIP No. U22133. See also TIP No. U20704; 1 November 1951. ABSTRACT: Panoramic impedance measurements: The plotter determines impedance from 900 to 1300 mc. by automatically measuring the load impedance as a function of frequency and plotting it as a continuous curve on a Smith chart. The magnitude and phase of the reflection coefficient in a transmission line feeding the load are determined and plotted separately as radial and angular coordinates by means of a polar recorder. A loop type of directional coupler appeared most desirable for use in the plotter. The phase-servo, controlled by error signals from the discriminator, and the turntable, automatically positioned by input signal phases, were built. Hybrid rings gave satisfactory phase-discriminator performance at 800 and 1000 mc. The construction of a hybrid ring and a phase shifter for use at 2650 mc. is required before the phase-measuring circuit can be operated. Antenna polarization parameters: Methods were developed for solving certain antenna problems by circuit and transmission line theory. An example is the variation of the polarization transmitted from an aperture in a conducting sheet excited through a wave guide of variable length. A systematic design technique was developed for devices which can transform the polarization of a given antenna to another polarization such as circular. Efficiency measuring techniques: Methods studied for measuring antenna efficiency were: the wave guide array, the nodding rotator, the input impedance, and the auxiliary antenna. A working model of the wave guide array equipment was constructed and satisfactorily tested. The other 3 methods appear promising. Preliminary cross checks were made with the input impedance and auxiliary antenna methods; the nodding rotator is being assembled. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3249. WAIT, J. R., "The Magnetic Dipole over the Horizontally Stratified Earth," Canadian Journal of Physics, pp. 577-592; November 1951. ABSTRACT: The behavior of a small current carrying wire loop over a horizontal stratified is investigated. The layers are considered to have a contrast in conductivity and dielectric constant only. Both harmonic steady state and step function sources are considered. (a-5, b-1, c-1, d-7, e-0, f-Conductivity)

3250. WELLER, R. K., "Minimum Approximation Solution for Determination of Position from Radio Doppler Data when Over-Determination of Missile is Realized," Ballistic Research Labs., Aberdeen Proving Ground, TIP No. U21895; 29 November 1951. ABSTRACT: Two theorems are given which provide a systematic procedure for obtaining the best solution of n (n > m, the number of unknowns) linear equations by the minimum approximation method. An application of this method to radio Doppler data as an alternative solution to the usual least-squares approach is presented. The problem is essentially one of finding the intersection of 3 or more prolate spheroids, each of which has 1 focus at the transmitter and the other at 1 of the respective receiving stations. A numerical example of this method is given. (a-3, b-3, c-1, d-1, e-0, f-Theory on least squares)

3251. ANONYMOUS, "Aircraft Navigational Aids," Engineer (London), vol. 192, pp. 702-703; 30 November 1951. ABSTRACT: An account of the facilities provided by (a) the Marconi vhf D/F system for instantaneous visual indication of bearings and position fixing by the ground station; (b) the Mullard "telescribe" equipment in experimental use at London airport, by which written messages, maps, etc , are instantaneously reproduced on the cathode-ray screen of a distant receiving unit; and (c) the Decca "flight log." (a-5, b-2, c-1, d-5, e-0, f-Description)

3252. CAHN, C. R., AND LEPAGE, W. R., "Signal Resolution in Wide Aperture D/F Systems in the Presence of Noise," Institute of Industrial Research, Syracuse U., Progress Rept. no. 6; 6 September-30 November 1951, TIP No. R6711. ABSTRACT: The theoretical method considered for increasing the resolution obtainable with a D/F antenna was based on the assumption of quantized antenna patterns. The result of this assumption was shown to be a set of linear simultaneous equations. A more simplified solution than obtained previously (TIP R5784) is presented which consists of straightforward algebraic manipulations. The analysis of the synchronous filter was continued with a quantitative investigation of the noise reducing properties of the filter; 2 approaches leading to different types of analyses were used. One is based on the existence of narrow frequency pass bands of the transmission characteristic of the filter, and the other is based on the possibility of averaging the noise over time intervals about equal to the buildup time of the filter. Both methods of analysis suggest that the rms value of the noise is reduced by a factor approximately proportional to the square root of the buildup time. The filter can pass a periodic wave substantially without attenuation; thus the filter can provide a significant increase in the S/N of a periodic signal if its frequency remains constant. Consideration was given to the possibility of increasing the resolution obtainable with a D/F antenna by cross correlating the antenna response to multiple incoming signals with the known single signal antenna pattern. If a visual observation is made of the resulting cross-correlation function, it is shown that there will probably be no improvement over a visual observation of the original antenna response; the only advantage in using cross correlation appeared to be a possible reduction of noise. (a-3, b-3, c-1, d-1, e-0, f-See Abstract Nos. 3192, 3222, 3227, and 3293)

3253. GREEN, F. M., "Calibration of Commercial Radio Field-Strength Meters at the National Bureau of Standards," National Bureau of Standards, Circular No. 517; December 1951. ABSTRACT: A brief description is given of the standards and methods used in the calibration of commercial radio field-strength meters at the National Bureau of Standards in the frequency range 10 kc to 300 Mc. A calibration consists in part of measuring the over all linearity of the field-strength meter at one or more frequencies and radio-frequency input voltage levels, and in measuring the internal attenuator ratios at one or more frequencies in terms of precision dissipative-type step attenuators, as well as precision mutual-inductance attenuators, depending upon the frequency being used. The remainder of the calibration consists in determining the so-called antenna coefficient or correlation factor of the set relating field strength to the output meter reading. Below about 30 Mc this is done only for sets using loop antennas in terms of a quasi-static magnetic field produced by a single turn balanced transmitting loop. Above this frequency for sets using only dipole antennas a locally generated radiation field is used and is evaluated in terms of the electromotive force induced in a horizontal receiving dipole. The accuracies of the various parts of the calibration are discussed for different portions of the above frequency range. (a-1, b-3, c-1, d-1, e-122, f-Calibration)

3254. MORITA, K., "Direction Finder and Flow Meter for Centimeter Waves," Proc. IRE, vol. 39, pp. 1529-1534; December 1951. ABSTRACT: The direction of arrival of the wave is indicated by the minimum response of a dipole located at the focus, and along the axis, of a small paraboloidal reflector. The performance of an experimental model for 10 cm waves is described. The flow meter indicates directly the active power flow of the wave in magnitude and direction, even when there are standing waves. An energy flow of 1μW/cm^2 at a wavelength of 10 cm has been measured. (a-1, b-1, c-1, d-1, e-0, f-Description)

3255. WELLER, R. K., "A Numerical Investigation of Residual Equations," Ballistic Research Labs., Aberdeen Proving Ground, TIP No. U20782; December 1951. ABSTRACT: Proposed solutions to mathematical problems are discussed in which there are sets of equations incompatible because of observational error and overdetermination. Since the proposed solutions are approximations, a further problem is the selection of a criterion by which the solutions may be evaluated. This note emphasizes that the residuals found in any one such solution must be carefully analyzed and not treated as an absolute criterion in the sense of being small, when the residuals are being examined for the purpose of judging the result obtained by the solution. As a problem were residual equations are vital, there is considered the Doppler determination of missile position with an overestimation of data in which a least-squares solution is desired. (See also TIP U19831) (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3232)

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3256. HUND, A., Short-Wave Radiation Phenomena, New York: McGraw-Hill Book Company, Inc., vol. 1, 1st Edition; 1952. ABSTRACT: This reference contains detailed analysis of radiating transmission lines. The directional pattern of the Beverage antenna is computed and the numerical data is given for an antenna one-half wavelength long with a velocity ratio of .95. Many other sections of this book are concerned with traveling wave excitation along linear conductors. (a-4, b-6, c-1, d-1, e-0, f-Reference)

3257. LAPORT, E. A., Radio Antenna Engineering, New York: McGraw-Hill Book Company, Inc., 1st Edition, 1952. ABSTRACT: A brief description of the Beverage antenna describing methods using reflection transformers to locate the termination resistor at the receiver end of the line. The four wave antenna array installed at Holton, Maine is described and patterns are given. (a-4, b-6, c-1, d-1, e-0, f-Reference)

3258. MOON, J. H., "Origin of Errors in Airborne MF Direction Finding," Marconi Rev., vol. 15, no. 106, pp. 97-113; 1952. ABSTRACT: Study of cause of nonsystematic errors which adversely affect performance of MF direction finder aloft; performance under various test conditions contrasted with that obtainable on marine installation; it is shown that accuracy of airborne equipment can be just as good as that of its marine counterpart if attention is paid to elimination of nonsystematic errors. (a-3, b-1, c-1, d-5, e-0, f-Errors)

3259. O'MEARA, T. R., AND WEBB, H. D., "Phase and Gain Stabilization in Matched-Channel Receivers," Proc. NEC (Chicago), vol. 8, pp. 376-386; 1952. ABSTRACT: Factors leading to mismatch of gain and phase characteristics are discussed. Careful matching of components, use of low-impedance selective circuits, use of fixed-tuned amplifiers whenever feasible, and use of automatic phase-matching are recommended. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3260. PLEBAŃSKI, J., "Goniometric Method with One Transmitter," Przeglad telekom., no. 12, pp. 387-389; 1952. ABSTRACT: In the directive reception of rotating field (by frame or Adcock aerials) in the vicinity of a transmitter, a deviation in direction is found which varies inversely as the distance from the transmitter. For larger distances this effect vanishes, but with circuit improvements the method can still be used. A range of up to 1000 km was covered. A formula for the deviation is derived and numerical examples given. For the measurement of the distance, the direction of the transmitter should be known in advance; it can be established, however, if the transmitter produces both rotational and non-rotational radiations on different frequencies. (a-3, b-1, c-22, d-22, e-0, f-Theory)

3261. SCHELKUNOFF, S. A., AND FRIIS, H. T., Antennas - Theory and Practice, New York: John Wiley & Sons, Inc., 1952. ABSTRACT:

A brief development of the theory of the Beverage antenna including derivation of equations for the pattern in the horizontal plane. Use of the reflection transformer is described and measurements from the four wave antenna array at Holton, Maine are given. Formulas are also given for the efficiency of the wave antenna as compared to short verticals. (a-4, b-6, c-1, d-1, e-0, f-Reference)

3262. TROOST, A., "New Viewpoints on the Development of Short-wave Adcock Direction Finders," VDE-Fachber., vol. 16, no. 5, pp. 44-47; 1952. ABSTRACT: Night-effect errors are briefly discussed and means of reducing them are considered. These include matching of the aerials to their feeder cables, stabilization of aerial input impedance, and the use of ferrite materials in the goniometer, with a symmetrical arrangement of the feeder cables with respect to earth. An improvement of the vertical diagram can be obtained by increasing the effective length of the masts. The use of masts consisting of two sections with a parallel LC circuit interposed and series LC top termination, giving an almost purely resistive aerial, has decided advantages for wide-band operation. Discussion of mast separation and number of masts indicates that a 6-mast system, with opposite masts 0.74 λg apart (λg being the shortest operational wavelength) is the best. Recent developments in goniometer design and in arrangements for obtaining increased accuracy are briefly mentioned and illustrations are given of a 6-mast installation with mains-operated receiver. This has a double IF transformation, the first IF being 1.8 Mc/s and the second 70 kc/s. Low-attenuation 3-stage filters are adjustable between ±250 c/s and ± 4 kc/s. Tests showed a sensitivity of 2μV/m field-strength for a 1° minimum. (a-2, b-1, c-4, d-4, e-0, f-Survey)

3263. WILLIAMS, JR., R. B., "Continuous-Indicating Loran," Proc. NEC (Chicago), vol. 8, pp. 365-375; 1952. ABSTRACT: A description is given of a system in which the match of MF loran pulses in amplitude and in time difference, manually set up, is maintained over a very wide range of signal amplitudes. Each loran receiver of this modified type displays continuously a time-difference reading corresponding to a loran line of position, so that two such units determine the two lines of position necessary for a continuous navigational fix. Field tests have proved the system to be especially advantageous for use in aircraft. (a-3, b-1, c-1, d-1, e-0, f-Description - Loran)

3264. ZINKE, O., "Modern Directional Aerials for the Shortest Wavelengths," VDE-Fachber., vol. 16, no. 5, pp. 27-32, 1952. ABSTRACT: An illustrated review of the general constructional principles of: (a) large dipole-fed paraboloids; (b) horn-fed metal-late lens-aerials; and (c) "lance-aerials," consisting of arrays of 4 or 8 rhombic aerials separated by 8λ or more in a plane normal to the direction of the main radiation lobe. A contributed discussion is included. (a-2, b-1, c-4, d-4, e-0, f-Survey and discussion)

3265. ALLISON, J. L., "Direction-Finder Data-Transmission System," Federal Telecommunication Labs., Inc., Interim engineering rept. no. 6, October-December 1951, TIP No. R6229; January 1952 ABSTRACT: Additional data are being collected to determine a correlation between bearing dependability and signal characteristics. In addition to the 30-c. voltage level in the D/F receiver output, the 60- and 90-c. components were extracted and measured. A mechanical coder-sender was designed to obviate certain difficulties in the original unit; these factors were indexing the optical coding wheel and developing a clutch for the sender-distributor. A circuit was devised which permitted the use of a sender-distributor which could turn continuously, except during standby periods. In place of the optical coding wheel, a pair of mechanical coding drums was used. An optical decoding system is to be used because of the necessary rapid rotation of the decoding wheel. A satisfactory system was tested which employs 1000 c. across each phototube. The decoding switching network was revised to permit the decoding wheel to move beyond the coincidence orientation without recycling. (See also TIP R5805) (a-3, b-3, c-1, d-1, e-0, f-Description)

3266. HARRINGTON, R. F., AND LEPAGE, W. R., "Directional Antenna Arrays of Elements Circularly Disposed about a Cylindrical Reflector," Proc. IRE, vol. 5, p. 83; January 1952. ABSTRACT: The general solution for the field pattern of a circular array is adapted to include the effect of a concentric reflecting cylinder. Two solutions are presented, one giving the field as a Fourier series, and the other as an infinite series of Bessel functions. The results are general, being applicable to any array dimensions and for arbitrary distribution of excitation. The solution is idealized to the extent of assuming a continuous current sheet, rather than discrete elements, and an infinitely long cylindrical reflector. (a-1, b-1, c-1, d-1, e-1, f-Theory-radiation)

3267. WATTS, C. B., "Some Considerations of Wide Aperture Localizer Antennas," U.S. CAA, Technical Development and Education Center, Indianapolis, Indiana. See Department of Commerce PB122140; January 1952. ABSTRACT: The development of two possible types of wide aperture localizer antennas is outlined, both of which are based on the use of waveguide-fed slot elements. It is concluded that the methods described have promise and should receive experimental investigation. (a-3, b-3, c-1, d-1, e-0, f-Navigation aids)

3268. EGGERTON, W. H., AND DIEHL, E. J., "Ground Portable Radio Direction Finder," Melpar, Inc., Final engineering rept., 12 July 1950-31 December 1951, TIP No R6231; 15 January 1952. ABSTRACT: The AN/PRD-4(XW-1) receiver circuitry comprises the following plug-in subassemblies: antenna-RF and mixer-oscillator trays; wide- and narrow-band crystal filters; IF, BFO, and power output units; and output meter. Associated equipment includes the battery; antenna; tripod, azimuth scale, and compass; headset; carrying harness; and parachute-drop case. Performance of equipment was generally in accordance with specifications except for an unbalance of the loop causing inadequate bearing accuracy and null ratio, a 6-db. bandwidth of the narrow-band crystal filter of 250 c. (specification limit, 300 c. or greater), and an attenuation at 900 c. of 57 db. (limit, 60 db. or greater). The receiver met the 60-db. limit for IF rejection except near the IF frequency, upper end of band 2, and lower half of band 3, the minimum IF rejection was 35 db. at 2.25 mc. The local oscillator radiation varied from 36 to 8 μv./m. across the 5 bands, the limit being 10 μv./m. at 10 ft. (a-3, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 3208)

3269. BOLLJAHN, J. T., "Antennas for Airborne Automatic Direction Finders Systems," Stanford Research Inst., Interim engineering rept., February 1952, TIP No. U22197. ABSTRACT: The operating principles of a typical ADF system and the corresponding antenna requirements are outlined. Data are given from experimental work on sense antenna location and sensitivity studies conducted with an electrostatic cage. Two forms of flush sense antennas were investigated; the measured data were used to estimate the aperture sizes and cavity depths needed to meet specifications. LF loop bearing errors are discussed and an analog measuring method is described for determining bearing errors by means of an electrolytic tank and nonconducting aircraft models. Measured curves show less in sensitivity and loops in rectangular cavities. A flight-test program utilizing a C-54 aircraft is proposed for obtaining the additional information necessary for an accurate appraisal of antenna requirements. (a-3, b-3, c-1, d-1, e-0, d-Report)

3270. MULHOLLAND, E. B., "A Multichannel Distance Measuring Equipment for Aircraft," Proc. IRE (Australia), vol. 13, pp. 47-58; February 1952. ABSTRACT: Description of radar equipment operating in conjunction with responder beacons at known locations on the ground. The aircraft set transmits pairs of pulses with a selected time interval; each beacon contains a discriminator and responds only to pulses with a certain interval. A 12-channel system operating in the 200-230 mc band has been adopted as a standard for use on Australian airlines. (a-5, b-1, c-1, d-11, e-0, f-Description)

3271. ANDREW, A., "Directional Ground Antenna Arrays with Beam Steerable in Azimuth for Operational Communication Tests of Aircraft Equipment," Alford Andrew, Consulting Engineers, TIP No. U21490; 13 February 1952. ABSTRACT: Ground antenna systems are being designed which are to maintain communication with flight missions from about 200 to 6000 mi. Three types of stationary arrays are described for use between 4 and 30 mc. In type 1 only 1 radiating element is active at any given time; each antenna can be connected to a separate transmitter, and all transmitters can be used simultaneously in different directions. Arrangements of type 1 are (1a) groups of dipoles with reflectors, groups of rhombic antennas, and (1b) group arrays of small rhombics, or an arrangement in a collinear end-on array. In type 2, two or more radiating elements are active at the same time, permitting the use of several transmitters simultaneously in different directions. Examples of type 2 are (2a) an array consisting of 24 horizontal conical dipoles arranged around a reflector comprising a number of parallel wires, and (2b) a group of 3 very small rhombic antennas. In type 3, all radiating elements are used at the same time and are supplied power continuously as the beam direction is changed. The systems are compared in an accompanying table. (a-3, b-3, c-1, d-1, e-0, f-Description)

3272. CARNINE, R. L., AND BENKLEY, F. G., "Multisignal UHF Direction Finder," Melpar, Inc., Interim engineering rept. no. 8, 14 January-13 February 1952, TIP No. R6344; 25 February 1952. ABSTRACT: Tests showing a VSWR < 2 for a breadboard λ/4 strip-

line stub-type commutator indicated the feasibility of this method of commutation. Preliminary test results for a breadboard capacitive-type commutator with a single couple-element set indicated VSWR's ranging from 2.38 at 225 mc. to 1.5 at 400 mc. Possibilities being considered for reducing the size of the commutator include a cylindrical-type configuration with the elements printed and Ag-plated on a formed tube of dielectric material. An extremely compact 36:1 coupler is being constructed for tests. An alternative design, a flat strip coupler, has a theoretical VSWR of 1.37; the unit is not readily adaptable to a rotary configuration. Balanced clamping circuits were added to the indicator unit to eliminate capacitive feed through. The phase shift of signals is being studied in an attempt to determine the possibility of adding the same shifts to the clamping and blanking functions. A commutator and filter for supplying input signals are being developed to simulate (a) a single 6° return, (b) two 6° returns separated by 15°, (c) the same signals with a 20-db. difference, and (d) a multiple return with various spacings. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3237)

3273. ANONYMOUS, "Operational Test of the ID-250/ARN Indicator," Naval Air Test Center, Patuxent River, Final rept., 29 February 1952, TIP No. U21258. ABSTRACT: Tests indicated that the 10%-c. vibrator inverter power supply of the AN/ARN-6 is unsatisfactory for use with the ID-250/ARN. Pointer spinning occurred for the ID-250/ARN when a rotor voltage of 35 v. or greater was used. If a separate power supply is used to energize the selsyn rotors, the recommended voltage is 20 to 30 v. at 300 to 425 c. The selsyn units of the loop and the indicator units were compatible from a stator voltage standpoint. (a-3, b-3, c-1, d-1, e-0, f-Final project report. See Abstract Nos. 3225 and 3243)

3274. GABLER, H., GRESKY, G., AND RUNGE, W., "Comparison between Frame-Coil and Stretched-Wire-Loop Aerials for Ship Direction Finders," Telefunken Ztg., vol. 25, pp. 5-11; March 1952. ABSTRACT: Measurements showed that when using the Telegon direction finder with its crossed coils of area 0.95 m^2, the width of the minimum was 2.4 times greater than with stretched-wire loops of area about 9 m^2. The direction-finding sensitivity of the Telegon equipment was found equal to that of goniometer direction finders using stretched-wire loops of area about 10 m^2. Theoretical investigations of the effect of the geometry and electrical data of a coil on the sharpness of the D/F indication were confirmed experimentally. (a-5, b-1, c-4, d-4, e-0, f-Evaluation, antenna)

3275. HOPKINS, H. G., AND HORNER, F., "Rotating 'H'-Type Adcock Direction-Finders for Metre and Decimetre Wavelengths," Proc. IEE (London), Part III, vol. 99, pp. 96-97; March 1952. ABSTRACT: This is a commentary concerning an earlier paper dated October, 1951, and appearing in Part IV of the JIEE. (a-4, b-1, c-1, d-5, e-0, f-See Abstract No. 3240)

3276. LAPORT, E. A., "Design Data for Horizontal Rhombic Antennas," RCA Rev., vol. 13, pp. 71-94; March 1952. ABSTRACT: The practical difficulties of determining the complete radiation patterns for horizontal rhombic aerials at a number of working frequencies are discussed. A method of design is described which greatly reduces the labour of computation, using tables giving the spherical co-ordinates for all pattern lobes for a free-space rhombic radiator through those of the sixth order. With these data, the performance of a horizontal rhombic aerial over a range of working frequencies can be simply investigated. Stereographic design charts of the type suggested by Donald Foster in 1937 are then introduced and described for computing the complete radiation pattern. Sets of these transparent charts for leg lengths of 2-7 wavelengths are described. (a-5, b-1, c-1, d-1, e-0, f-Description)

3277. STEIDLE, W. E., "Requirements for Modern Radio Direction Finders and Means for Their Fulfilment," Telefunken Ztg., vol. 25, pp. 12-15; March 1952. ABSTRACT NO. 1: Discussion of sensitivity and sharpness of direction indication, with comparison results for Telefunken ship equipment used with different antenna systems. The use of an iron-cored goniometer in conjunction with a high-gain superheterodyne receiver has increased the sensitivity of the Telegon D/F equipment, using crossed screened frame coils of area 0.95 m^2, up to that of equipment on the German hydrographic survey vessel Gauss which used crossed stretched-wire loops of area 9 and 52 m^2, respectively. ABSTRACT NO. 2: Increase of sensitivity, bearing accuracy and wavelength range are discussed and a general account is given of the way these are secured in the Telegon equipment by the use of a screened iron-cored goniometer and a fixed system of screened frame-coils of area 0.95 m^2. (a_1-6, a_2-5, b-1, c-4, d-4, e-0, f-Discussion, RDF)

3278. TROOST, A., "Recent Developments in Short-Wave Adcock Direction Finders," Telefunken Ztg., vol. 25, pp. 16-27; March 1952. ABSTRACT NO. 1: The relative merits of U-type and H-type antennas are discussed. For transportable equipment U-type antennas are preferable. Systematic errors can be reduced by increasing the number of antennas used; this also results in increased sensitivity. Subdivision of antennas gives improvement as regards night effect, suppression of resonance errors, and a cosine type of vertical characteristic for single antennas throughout the frequency range. A six-mast system is considered the best. With eight or more masts the slight increase of sensitivity is offset by increased liability to polarisation and resonance errors. A description is given of equipment using six 8.5-m telescopic masts at the corners of a hexagon 8 m across. The goniometer is of the iron-ring type with es screen. The use of a push-pull wide band amplifier gives a sensitivity of 0.15-0.3μV/m, depending on the frequency, the range covered in four bands being 4.5-25 mc. ABSTRACT NO. 2: An iron-cored goniometer is employed and the aerial input impedance has been reduced. To lessen the errors due to the size of the base while maintaining 1° bearing accuracy, more than two pairs of aerials should be employed. With an odd number of masts azimuthal errors do not occur, but the minimum is not so easily set. Telefunken have used a 6-mast system in which the aerial base impedance varies only slightly over a wide frequency range and for which the base line is 8 m. The masts, 3 Al tubes 6 cm in diameter mounted atop one another, are 8.5 m high. Performance data include a bearing sensitivity of 2.5-4μV/m for a minimum width of 1° and a bandwidth of 1500 c/s. (a_1-6, a_2-3, b-1, c-4, d-4, e-0, f-Evaluation analysis)

3279. RYLE, M., "A New Radio Interferometer and Its Application to the Observation of Weak Radio Stars," Proc. Roy. Soc. A., vol. 211, pp. 351-375; 6 March 1952. ABSTRACT NO. 1: The reception pattern of a pair of in-phase spaced antennas is $A(\theta)$. If a $\lambda/2$ length of feeder is inserted in the line to one of them the pattern in which the maxima and minima are interchanged, becomes $A^2(\theta)$. A switch changes the pattern rapidly from A_1 to A_2 so that the output contains an alternating component which is proportional to (A_1-A_2) and to the power flux received from a point source. An amplifier discriminates in favor of the alternating component and allows the output due to a point source to be observed without interference from steady sources or random noise. The method can be used for the detection of weak point sources but has other important advantages, including high accuracy of position finding. ABSTRACT NO. 2: A new type of radio interferometer has been developed which has a number of important advantages over earlier systems. Its use enables the radiation from a weak "point" source such as a radio star to be recorded independently of the radiation of much greater intensity from an extended source. It is therefore possible to use a very much greater recorder sensitivity than with earlier methods. It is, in addition, possible to use pre-amplifiers at the aerials, and the resolving power which may be used is therefore not restricted by attenuation in the aerial cables. Besides improved sensitivity, the new system has a number of other advantages, particularly for the accurate determination of the position of a radio source. Unlike earlier systems the accuracy of position finding is not seriously affected by rapid variations in the intensity of the radiation. It also has important applications to the measurement of the angular diameter and polarization of a weak source of radiation. The new system has been used on wavelengths of 1.4, 3.7, 6.7 and 8 m for the detection and accurate location of radio stars, and for the investigation of the scintillation of radio stars. It has also been used in a number of special experiments on the radiation from the sun. The results which have been obtained in these experiments have confirmed the advantages predicted analytically. (a_1-6, a_2-1, b-1, c-1, d-5, e-957, f-Description)

3280. BURNETT, W. W., AND HLYWA, H., "Flight Test and Evaluation of AN/ARA-25 Automatic Direction Finder Equipment," Naval Air Test Center, Patuxent River, Final Rept., TIP No. R6210. ASTIA No. AD-23086; 18 March 1952. ABSTRACT: The AN/ARA-25 equipment performed satisfactorily during air-to-air rendezvous, air-to-ground homing, and air-sea rescue operations. The equipment was considered satisfactory as an aid to air-to-air rendezvous for tactical operations and is recommended as an air-to-ground and air-sea rescue homing equipment. With respect to the F2H-1 installations tested, the AN/ARA-25 and AN/ARN-6 were equally accurate. The AN/ARA-25 was considered a satisfactory interim replacement for the AN/ARR-2A, but was not recommended for ADF use unless wing-reflection errors can be fully compensated. (a-3, b-3, c-1, d-1, e-0, f-Test report)

3281. ANONYMOUS, "Bureau of Ships Contract Specification Direction Finder Set, Medium Frequency," USN, Ships-D-4145," 20 March 1952. ABSTRACT: These specifications cover the design, development, and construction of a simple radio direction finder (D/F) equipment

covering the frequency range of 100 Kc/s to 4 Megacycles, for use aboard surface ships. (a-1, b-3, c-1, d-1, e-0, f-Specifications)

3282. KING, R., "Theory of Electrically Short Transmitting and Receiving Antennas," Cruft Lab., Harvard U., Technical Report No. 141, TIP No. U22096; 20 March 1952. ABSTRACT: Complete and quantitatively accurate solutions of the properties of electrically short transmitting and receiving antennas (of length 2h such that $2\pi h/\lambda_0 \leq 1$) are obtained by determining the distribution of current that actually satisfy the integral equations. Components of current in phase and in phase-quadrature with the driving voltage or the incident electric field are evaluated together with the impedance the effective length, and the gain. When the King-Middleton method (Quart. Appl. Math. 3:302, Jan. 1946 and J. Appl. Phys. 17:273, April 1946) of solving Hallén's integral equation (Nova Acta Royal Soc. Sciences, Upsala 11:1, 1938) by iteration is applied correctly, quite accurate results are obtained even in a first-order solution. The greatest error in the first-order formulas is shown to be in the resistance, a small quantity of higher order compared with the reactance. The newly determined values are combined with the King-Middleton second-order results to obtain more complete and more accurate impedances and effective lengths in the range of $0 \leq 2\pi h/\lambda \leq 1.4$. Difficulties with the present solutions of the Hallén integral equation, and the cylindrical dipole receiving antenna are discussed in an appendix. (a-3, b-3, c-1, d-1, e-0, f-Theory)

3283. KESSLER, W. J., AND HERSPERGER, S. P., "Recent Developments in Radio Location of Thunderstorm Centers," Bull. Amer. Met. Soc., vol. 33, pp. 153-157; April 1952. ABSTRACT: Short account of the triangulation method used by the U.S. Air Forces during the war, and of the single-station technique being investigated at the University of Florida. (a-5, b-1, c-1, d-1, e-0, f-Survey)

3284. MESSERSCHMIDT, W., "The Measurement of Angles by Direction-Finding Technique," Arch. tech. Messen., No. 195, pp. 73-80; April 1952. ABSTRACT: Discussion of the principles of various methods and review of applications in air, marine and ground radio-location systems, with indication of the limitations imposed by the antenna characteristics. (a-5, b-1, c-4, d-4, e-0, f-Discussion)

3285. MORITA, K., AND SEKIGUCHI, T., "Equipment for Determining the Direction of Centimetre Waves in Terms of θ and ϕ Simultaneously," J. Inst. Elect. Commun. Engrs., Japan, vol. 35, pp. 154-159; April 1952. ABSTRACT: The direction of an incoming wave is indicated by minimum response of a dipole aerial at the focus of a small paraboloidal reflector and parallel to its axis. Opposed metal quadrants in the plane of the aperture of the reflector are rotatable about the axis of the reflector. Diagrams illustrate the action of the device. (a-2, b-1, c-6, d-6, e-0, f-Description)

3286. SLETTEN, C. J., MAVROIDES, W. G., RUZE, J., ALLEN, C. C., DOMINY, J. F., AND TAYLOR, T. T., "Side-Lobe Conference," USN, NRL Report No. R-4043; April 1952. ABSTRACT: This side-lobe conference was an outgrowth of the Fourth Symposium on Scanning Antennas. Several papers offered for presentation at the Symposium appeared to convey information on the general subject of side-lobe evaluation and suppression. It was therefore felt advisable to include these papers in a separate session and to invite additional papers to fill out the program. The report consists of the following papers: CARLYLE J. SLETTEN and WILLIAM G. MAVROIDES, "A Method of Side-Lobe Reduction," JOHN RUZE, "Effect of Aperture Distribution Errors on the Radiation Pattern," CHARLES C. ALLEN, "Antenna Pattern Calculation for Asymmetrical Aperture Distributions," JOHN F. DOMINY, "The Effects of Mechanical Deviations in Radar Antenna Reflectors," and T. T. TAYLOR, "An Antenna Pattern Synthesis Method." (a-1 and 4, b-1, c-1, d-1, e-194, f-Theory, papers)

3287. STANNER, W., ET AL., "Leitfaden der Funkortung," (Manual of Radio Direction Finding.) Elektron-Verlag, Garmisch-Partenkirchen; 1952. See Fernmeldetech. Z., vol. 5, p. 197; April 1952. ABSTRACT: A general treatment including, in the longest and the most interesting section of the book, an account of D/F developments in Germany and of British and American radar technique. (a-4 and 5, b-6, c-4, d-4, e-0, f-Reference manual)

3288. WAIT, J. R., "Current-Carrying Wire Loops in a Simple Inhomogeneous Region," Jour. Appl. Phys., vol. 23, no. 4; April 1952. ABSTRACT: The electromagnetic fields of a small current carrying insulated wire loop situated in the plane of separation between two dissipative media are calculated. (a-5, b-1, c-1, d-1, e-0, f-Theory)

3289. WAIT, J. R., "Propagation of Radio Waves over a Stratified Ground," Geophysics, vol. 18, no. 2, pp. 416-422; April 1952. ABSTRACT: The propagation of vertically polarised radio waves over a horizontally stratified medium is investigated. A general expression for the "wave tilt" is derived for the case of any number of layers with arbitrary properties in each layer. Numerical calculations are carried out for the special case of only two layers which show that the conductivity and dielectric constant variations of the lower layers will affect the magnitude and phase of the wave tilt. (a-1, b-1, c-1, d-1, e-567, f-Study, propagation)

3290. HORNER, F., "An Investigation of Polarisation Errors in an H-Adcock Direction-Finder," Instn. Elect. Engrs. Monogr., no. 35, 15 April 1952. ABSTRACT: The polarisation-error characteristics of H-type Adcock direction-finders operating in the vhf band and in the upper part of the HF band are controlled to a large extent by resonance phenomena. A theoretical and experimental investigation of a rotating system for vhf has demonstrated the feasibility of calculating, from the physical dimensions of the aerial system, the frequencies at which large errors are liable to occur, and also the magnitudes of the maximum errors. The lowest resonant frequency is that for which the product of aerial length and spacing is $1/20\,\lambda^2$. A second resonance occurs when the spacing is $1/2\,\lambda$ and, if the aerial length is approximately equal to the spacing, the third resonance occurs when the spacing is $0.8\,\lambda$. The major causes of polarisation errors are discussed and formulae are given for calculating these errors. The agreement between the calculated and measured errors at the resonant frequencies suggests that the three causes discussed account for nearly all the errors. Various methods of minimising errors are examined theoretically and experimentally. Although the instrument used for the experimental investigation was designed for vhf, the results have application to a wider band of frequencies and to instruments of both fixed and rotating types. (a-1, b-1, c-1, d-5, e-0, f-Study, errors)

3291. DUHAMEL, R. H., "Pattern Synthesis for Antenna Arrays on Circular, Elliptical, and Spherical Surfaces," University of Illinois, Electrical Engineering Laboratory, Technical Report No. 16, Contract No. N6-ORI-71 Task XV. See also Department of Commerce PB144814; May 1952 ABSTRACT: A general method of pattern synthesis is presented for an array of antenna elements placed on a circle, an ellipse, a sphere, a spheroid and an ellipsoid. Since only the element pattern is required, the antenna elements may be dipoles or loops, either with or without a concentric reflecting surface, or slots. This method of pattern synthesis could be quite useful in the design of antenna systems for direction finding, radar, and other applications. (a-3, b-3, c-1, d-1, e-0, f-Descriptive analysis)

3292. GELHARD, E., "Magnetic Properties of Ferrite Materials," Tele-Tech., vol 11, no. 4, pp. 50-52, 82-84; May 1952. ABSTRACT: Not available. (a-4, b-2, c-1, d-1, e-0, f-Ferrites)

3293. GOLDMAN, S., AND LEPAGE, W. R., "Signal Resolution in Wide Aperture D/F Systems in the Presence of Noise," Syracuse University, Research Institute, Progress reports and Final Report, 1 December 1951 to May 1952, ASTIA Nos. AD-4622, AD-2205, and AD-73 083. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Reports. See earlier Abstract Nos. 3192, 3222, 3227, and 3252)

3294. SIX, W., "Some Applications of Ferroxcube," Phillips Technical Review, vol. 13, no. 11, pp. 301-311; May 1952. ABSTRACT: It is not possible to indicate any general rules governing the uses of Ferroxcube materials; in fact, it is necessary to investigate each individual case on its merits to determine whether and in what from Ferroxcube can be employed. At the same time, a few examples in which Ferroxcube has amply proved the value of its properties will serve to furnish some idea of the field of possibilities which this material has opened, and of methods that will ensure the best practical results. Ferroxcube is a ceramic magnetic material which may be described chemically as consisting of mixed crystals of simple cubic ferrites such as Mn-An-ferrite (Ferroxcube III) and Ni-Zn-ferrite (Ferroxcube IV). These materials were originally developed as material for the cores of inductors such as are used in telephone work, where the eddy current losses inherent in the highly conductive metallic ferromagnetic materials at the higher frequencies render the use of these materials extremely difficult. It may be assumed to be sufficiently well-known that, so far, we have open to us a choice of two methods

by means of which iron (i.e. highly conductive) cores can be made suitable for use at high frequencies, namely by laminating the core or by using the so-called powder-core. In either case the eddy current losses are certainly reduced but, as we shall presently show, these expedients do not provide an ideal solution to the problem. On the other hand, owing to the generally high volume resistivity of Ferroxcube the eddy current losses in this material are relatively small, even in the case of the solid material. Beyond a certain frequency, which is dependent on the composition of this material, the "residual" losses in Ferroxcube may be quite considerable; it appears that this frequency (described as the "ferromagnetic resonant frequency") is proportionately higher according as the initial permeability of the material is lower. It is therefore possible, at the cost of the initial permeability, to extend the range of frequencies within which the residual losses will remain sufficiently low, this being but one example of the much more general variability of the properties of Ferroxcube. The facility that exists for varying the composition of the material as desired enables us so to vary the various characteristics that the requirements imposed by a particular problem will be met in the best possible manner. At the same time, in order to secure the fullest advantages of these new ferromagnetic materials, such problems should be approached as far as possible with a certain open-mindedness, in not only endeavouring to suit the choice of material to the problem, but, if necessary, to present the problem in such a light that it will fit in with the possibilities offered by the unusual properties of the new material. Before proceeding to a discussion of the actual examples of the uses of Ferroxcube, we should say something about the general characteristics of magnetic circuits in which an air-gap is incorporated. (a-1, b-1, c-1, d-12, e-0, f-Ferrites)

3295. ANONYMOUS, "Analysis and Measurement of Antenna Parameters," Antenna Lab., Ohio State U. Research Foundation, Interim engineering rept., 16 January-15 April 1952, TIP No. U23188; 5 May 1952. ABSTRACT: A model frequency changer for the panoramic impedance plotter was set up and tested for efficiency and sensitivity characteristics. Operation appeared adequate for use in the complete impedance plotter. An alternate system was produced for measuring phase at lower frequencies. This method depends upon the fact that the magic T used as the phase discriminator and the continuous type phase shifter using helical transmitting and receiving elements are are inherently broad-band devices. The problem is discussed of designing an aperture-type antenna which is circularly polarized over a band of frequencies The pertinent polarization parameters may be completely specified by a single complex parameter u. Proof is given for a theorem which states that, in order to obtain a circularly polarized wave, the polarization parameter u must equal the complex conjugate of the aperture reflection coefficient. A practical system for measuring the frequency variation of u is described as well as a procedure for designing an antenna having a low axial ratio over a frequency band. Components of the LF efficiency meter were modified, and operational tests were conducted on the system as a whole A theoretical analysis led to the derivation of an invariant expression for the input admittance of a unipole. An introductory study of nonlinear systems was made based on the assumption that the output of the system is sinusoidal. By the use of open loop sinusoidal response the closed loop response can be obtained in a manner similar to that for linear systems. The type of representation indicates the stability, possible limit cycles, and response hysteresis. A relatively fast db recorder was developed (dynamic range 35 db.) for use with a bolometer detector. The dual detector db. recorder (dynamic range 50 db.), which gives the maximum sensitivity obtainable from a crystal and is relatively slow, is being constructed with improved components (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3296. ANONYMOUS, "Operational Suitability Test of Rawin Set AN/GMD-1," Air Proving Ground Command, Final rept., 5 May 1952, TIP No. U22864 ABSTRACT: The AN/GMD-1, a transportable radio direction finder for automatically tracking a balloon-borne radiosonde, was evaluated under arctic winter conditions; 103 radiosonde releases were made at -10 to -59°F. The equipment includes a 1680-mc. rawin receiver, parabolic antenna, and control unit mounted on a metal base. A control-recorder unit permits remote operation and records azimuth and elevation angles correlated with a time print The AN/FMQ-1 or -2 is used to record pressure, temperature, and humidity data. The set was satisfactory for operation to -30°F. Cables flexible below -30°F and a 200-w. strip heater to warm the azimuth gears are required for lower temperatures. An on-off switch was recommended for the exhaust blower fan because the fan should be operated only above 0°F to prevent unnecessary chilling of the receiver electrical components. The screw-type cannon plugs in the receiver were difficult to remove and replace, and captive-type screws were recommended for holding the base plate to the pedestal. The set, with modifications, was considered suitable for arctic use to replace the SCR-658 in R and Q radiosonde sections. (a-3, b-3, c-1, d-1, e-0, f-Test report)

3297 CARNINE, R. L., AND BENKLEY, F. G., "Multisignal UHF Direction Finder," Melpar, Inc., Interim engineering rept., no. 10, 14 March-14 April 1952, TIP No. R6798; 6 May 1952. ABSTRACT: Efforts were continued to design a multisignal direction finder consisting of a Wullenwever-type antenna, a commutating system, a radio receiver, and an indicator unit. When both mechanical and capacitive commutation were found to be impractical attempts were confined to a method based on the λ/4 flat-strip transmission line transformer. The breadboard construction consisted of 3 flat-strip transformers arranged radially. The lines have 50-ohm terminations and are electrically insulated. A drum-type construction was selected as the practical commutator configuration from the standpoint of physical size and rigidity, a commutator breadboard having 4 active line elements was designed especially for cross-talk and impedance check measurements Tests on a compact 36:1 transformer coupler indicated that the design technique is adequate for inclusion in the ultimate system. Criteria were established for attenuators to be used for the tapering elements. RG-58C/U coaxial cable was selected for phasing the illuminated antenna elements The problem of relative phase shift between the deflection and clamping signals was not completely solved by transmitting the clamping signal through a dummy control transformer; delay traced to the dc restorer and clipper circuits has necessitated modifications. The present commutator-type of generator is capable of simulating the receiver output for 6° beams separated by 15° and differing in level by 20 db It consists of a printed circuit type of disk commutator, a brush assembly, a motor drive, and a filter. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3272)

3298 ROSS, W., AND HORNER, F., "The Siting of Direction-Finding Stations," Radio Research Special Report No 22, His Majesty's Stationery Office. See Nature, vol. 169, p. 875, and U.S. Department of Commerce PB106738; 24 May 1952 ABSTRACT: Means of estimating the suitability of particular sites of those considered normally acceptable for D/F purposes are described The types of errors due to relatively small objects such as trees, poles, and small buildings, to larger obstacles such as cliffs, mountains and woods, and to special objects such as wire fences, overhead telephone cables and stretches of water are considered. The position of any perturbing object relative to the transmitter or the D/F station can cause a wide variation in the error in estimated direction. The slope of the ground and the nature of the building housing the D/F equipment and aerial are also described. The errors due to one or more of those described above may be partially compensated when the station is calibrated. Tables showing typical errors arising from typical terrestrial conditions are given. A Bibliography is included. (a-5, b-3, c-1, d-5, e-0, f-Description)

3299. ANONYMOUS, "D/F Signal-To-Noise Improvement Unit," Engineering Research Associates, Inc., Final engineering rept., 29 May 1952, TIP No. R6705. ABSTRACT: The 5-section unit was completed. Three of the sections, the recording amplifier, magnetic drum assembly, and playback amplifier, are concerned with the input signal from the crash-locator beacon receiver; the other 2 sections, motor amplifiers and power supply, have supplementary functions. The input signal to the unit is fed to the recording amplifier where it is limited, amplified, and supplied as a constant-current signal to the recording head of the magnetic drum assembly. The recording amplifier includes a test-signal generating circuit to enable setup of the unit with no signal input from an external source. The recording amplifier is essentially a cathode-coupled phase inverter and a push-pull power amplifier. Good phase inversion was obtained from the inverter with less than 10% unbalance. The recording amplifier is capable of supplying the 30 ma. rms current required for the 1000-turn boundary-displacement recording head. The drum assembly includes the drum with drive motor, speed reduction gears, and recording, erase, and 16 playback heads. The method of boundary-displacement recording is discussed in detail. The signal from the 16 series-connected playback heads is sent to the playback amplifier and made available at the output terminals in either ac or dc form. The motor amplifiers accept the 2-phase reference-signal input and amplify it to a power level sufficient to operate the drum drive motor. The 2 inputs are independent and ungrounded within the unit so that either wire of one phase may be tied to either wire of the other to form a 3-wire system, the only limitation being that clockwise drum rotation is required. The circuits of the 2 amplifiers are nearly identical, the principal difference being in the source of the internal test signal. The power-supply section takes care of heater, plate, and screen requirements. The section includes a thermostatically controlled blower and heater to regulate the ambient temperature. The main power switch breaks both sides of the line, both of which are fused. Tests were performed on the unit by using random noise from a radio receiver superimposed on a typical test signal. The principle of noise reduction by successive additions of the repetitive wave form through the medium of magnetic storage was demonstrated. S/N improvements of about 10:1 can be expected from 16 successive additions under nearly all conditions. The

use of recirculation (the process of mixing a portion of the played-back output with the input to the recording system in phase with the input signal) yielded an additional improvement by an increase of the over-all storage beyond 16c. Recirculation also amplified the defects of the recording system and increased the effective storage time. Effective wave-form improvements of 100:1 were obtained by use of recirculation. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3235)

3300. LUNDBURG, F. J., AND BUCHER, F. X., "Cage-Type Very-High-Frequency Phase-Comparison Omnidirectional Radio Range Antenna," Elec. Commun., vol. 29, pp. 108-116; June 1952. ABSTRACT: Description of an antenna system consisting of a dipole rotating within a cage of vertical metal rods, together with an upper cage extension serving to suppress vertical polarization. Tests carried out on the system show that it has good azimuth accuracy, a small cone of silence, and vertical polarization 50 db below horizontal polarization for an upper-cage length of 12 feet, the whole system being mounted on a circular metal counter-poise 35 feet in diameter and 15 feet above the ground. Details are given of the tone wheel and magnetic pickup that provide the fixed-phase reference signal. (a-3, b-1, c-1, d-1, e-0, f-Description)

3301. VAN SÜCHTELEN, H., "Ferroxcube Aerial Rods," N.V. Philip's Gloeilampenfabrieken, Eindhoven, Holland, Electronic Application Bulletin, vol. 13, no. 6, pp. 88-100; June 1952. ABSTRACT NO. 1: Aerial rods are, in effect, loop-aerials of greatly reduced size. The reduction in size is made possible by employing a rod of ferromagnetic material which concentrates the magnetic flux of a large area into the small loop. In this paper the effects of various parameters on the performance of an aerial rod are discussed, particular attention being given to the application of FERROXCUBE aerial rods. ABSTRACT NO. 2: The size of loop aerials can be greatly reduced by using a core of some suitable magnetic material. The design is discussed of aerials using small coils wound on rods of ferroxcube. The losses and Q-factors of such aerials are investigated and experimental results are quoted. Temperature effects on the permeability of the core material are analysed. (a_1-1, a_2-5, b-3, c-1, d-12, e-242, f-Ferrites)

3302. BUCHHOLZ, L., "Optimum Input Transformer for Radio-Direction-Finders," Elektrotek. T., vol. 65, pp. 201-206; 5 June 1952. ABSTRACT: The coupling transformer between a frame aerial and the first amplifier grid can be chosen to give maximum signal or maximum S/N ratio. These two conditions are not the same. Solutions applicable to frequencies below 1500 kc/s are calculated in detail with numerical examples. (a-2, b-1, c-4, d-21, e-0, f-Descriptive analysis)

3303. ABBOT, F. R., "Design of Optimum Buried-Conductor r.f. Ground System," Proc. IRE, vol. 40, pp. 846-852; July 1952. ABSTRACT: From the design equations developed, a radial-conductor earth system may be constructed which will provide maximum power radiated per dollar of overall cost. The fundamental equations are particularly applicable to any installation operating in the frequency range below 1000 kc/s. A radial-conductor earth system based on the design parameters here presented will assure l.f. aerial efficiencies of 50% or better as compared to efficiencies of 25% or less usually encountered in similar aerials without such an earth system. A technique for achieving optimum design of radial-conductor ground systems was developed. Curves were prepared which facilitate the determination of optimum spacing and length of the ground radials. A typical computation is included. (a-1, b-1, c-1, d-1, e-0, f-Description)

3304. FISCHBACH, J. W., "Solution of Least Squares Problems by an N Step Gradient Method," Ballistic Research Labs., Aberdeen Proving Ground, TIP No. U24607; July 1952. ABSTRACT: A procedure is given for finding the least-square minimum, and the most probable value of the least-squares vector, without the necessity of explicitly finding normal equations and inverting the resulting matrix. The method is an application of an N-step gradient procedure and is especially well suited for use with high-speed digital computers. The proposed iterative procedure is applied to a problem given by Whittaker and Robinson (The Calculus of Observations, page 212, Blackie and Son, Ltd., London). Calculations indicate that the least-squares vector is independent of the initial starting approximation. Convergence of the N-step method is rapid to a high order of accuracy. (a-3, b-3, c-1, d-1, e-0, f-See also Abstract No. 3312)

3305. HORNER, F., "An Investigation of Polarisation Errors in an H-Adcock Direction-Finder," Proc. IEE (London), Part IV, vol. 99, pp. 229-240; July 1952. ABSTRACT NO. 1: The polarisation-error characteristics of H-type Adcock direction finders for the vhf band and the upper part of the hf band are controlled to a large extent by resonance phenomena. Investigation of a vhf rotating system shows that the frequencies at which large errors are liable to occur, and the magnitudes of the maximum errors can be calculated from the physical dimensions of the antenna system. The lowest resonance frequency is that for which the product of antenna length and spacing is $\lambda^2/20$. A second resonance occurs when the spacing is $\lambda/2$, and, if spacing and antenna length are about equal, a third resonance occurs for a spacing of 0.8. Three major causes of polarization errors are discussed and various methods of minimising errors are considered. ABSTRACT NO. 2: Investigation of rotating system for very high frequencies demonstrated feasibility of calculating, from physical dimensions of antenna system, frequencies at which large errors are liable to occur, and also magnitudes of maximum errors; three major causes of polarization errors and formulas for calculating these errors. (a_1-6, a_2-3, b-1, c-1, d-5, e-0, f-Study)

3306. BOWMAN, D. F., "Radiation Field of Rhombic Antennas Using Metal Supports," Weldon and Carr, Consulting Radio Engineers, Bimonthly technical rept. no. 1, 15 May-15 July 1952, TIP No. U23609. ABSTRACT: A study of metal supports for rhombic antennas showed that only the side supports appreciably affected the antenna performance. The antenna and supports were analysed as a transmission line and reflecting discontinuities. The transmission line formed by a type C rhombic transmitting antenna had a characteristic impedance that varied with position along the line but had an average value of over 600 ohms. A susceptance introduced by a metal side support resulted in a discontinuity which changed the current distribution on the antenna wires and permitted the support of an additional vertical current. The former affects principally the horizontally polarized pattern; the latter introduces vertically polarized radiation. An experimental quantitative study of the effects was initiated. Impedance data are to be obtained on a 22/100-scale full model and a 1/100-scale half model. Pattern measurements are to be made on a model of about 1/200 scale. (a-3, b-3, c-1, d-1, e-0, f-Study)

3307. TUTTLE, J. M., "F-94 Radio Compass Installation," Lockheed Aircraft Corporation, Burbank, California, Final Engineering Report, Contract No. AF 33(038)-11205, ASTIA AD-11 488; 19 July 1952. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

3308. CARNINE, R. L., AND BENKLEY, F. G., "Multisignal UHF Direction Finder," Melpar, Inc., Interim engineering rept. no. 13, 14 June-13 July 1952, TIP No. R7043; 30 July 1952. ABSTRACT: The commutator and the 36:1 coupler and rotary output joint were completely designed. A breadboard constructed of material to be used in the final commutator (Araldite dielectric) was tested with satisfactory results. The electrostatic deflection tube and the advantages of circular display are discussed. Fabrication of the cabinet and desk shelf was completed. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3297)

3309. RASINS, W. L., AND KREMPEL, F. M., "Direction Finder Set AN/SRD-7," Stewart Warner Corp., Interim engineering rept., 15 July-15 August 1952, TIP No. U24095. ABSTRACT: The complete AN/SRD-7 equipment consumed a maximum of 244 w. and 200 w. at the nominal 115-v. line supply. Noise studies made in an attempt to improve the receiver sensitivity indicated the necessity for redesigning the antenna coils which were originally designed for maximum signal but not S/N. The maximum reserve gains ranged from 14 db. in the low band (0.250 to 0.500 mc.), up to 18 db. in the 1- to 2-mc. band, and down to 1.6 in the highest band (16 to 32 mc.). Increasing the gain of the 2-mc. IF amplifier is expected to improve the reserve gains of the higher channels. The audio IF gain is to be increased to improve the 68 mw. AF output. Preliminary tests showed an unacceptable 0.10% frequency drift for a 15% line-voltage variation. The maximum over-all direction-finding sensitivity varied from 356 µv./m. in the low band, to 116 µv./m. in the 2- to 4-mc. band, and to 487 µv./m. in the highest band. Spot checks showed an accuracy within ±5° in a screen room; however, the data were considered inadequate because of probable field distortions. (a-3, b-3, c-1, d-1, e-1, f-Progress report)

3310. BUSIGNIES, H., "Dynamic Aspects of Errors in Radio Navigational Systems, Particularly in Cases of Fast-moving Receivers and Transmitters," Elec. Commun., vol. 29, pp. 226-228; September 1952. ABSTRACT: A general discussion including consideration of the effect of reflections from the surface of the earth. Accuracy can be effectively improved by sacrificing bandwidth for integration time.

Errors due to reflections can be averaged out by radiating a frequency spectrum such that the various reflected components are receivea random phases. Integration can then be applied over the frequency spectrum. (a-5, b-1, c-1, d-1, e-0, f-Discussion)

3311. DAVIS, R. C., "Glide-Slope Receiver," Elec. Commun., vol. 29, pp. 219-225; September 1952. ABSTRACT: Description, with performance specification, block diagram, and some circuit details of the new Type-154A receiver operating in the range 329.3-335.0 mc. Twenty frequency-determining crystals are provided and may be selected individually by means of a bank of 11 relays. With the exception of the voltage-regulator tube, the 12 tubes used are all of the "reliable" type developed for airline use. (a-5, b-1, c-1, d-1 e-0, f-Description)

3312. FISCHBACH, J. W., "Solution of a Set of Complex Linear Equations by an N Step Method," Ballistic Research Labs., Aberdeen Proving Ground, TIP No. U25183; September 1952. ABSTRACT: A method is given for solving a set of N complex linear equations in N steps. If there are more equations than unknowns, the proposed method will yield the least-squares solution. The method is general and leads to equations which may be obtained in the same form for simultaneous linear partial-differential equations and other cases. The simplicity of the computing procedure makes the method well suited for use on a high-speed digital computer. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3304)

3313. GLEASON, R. F., AND TREXLER, J. H.,"Ionospheric Limitations in the Ultimate Accuracy of Direction Finding," USN, NRL Memorandum No. 61; September 1952. ABSTRACT: Wide aperture direction finders are shown experimentally to have the potentiality of providing greater bearing accuracy than normal site and instrument errors will permit. Under typical ionospheric conditions, and working against burst type transmissions from low powered transmitters, a direction finder with an aperture of 1000 feet usually obtains a useful bearing resolution of 0.25 degrees. It is recommended that in undertaking the construction of a wide aperture system, great care be used in the siting and in the fabrication of the antenna. Small compromises in the design and erection could easily cause errors that would mask the inherent accuracy of the over-all system. (a-1, b-3, c-1, d-1, e-113, f-Evaluation: wide aperture)

3314. MOON, J. H., "The Origin of Errors in Airborne M. F. Direction Finding," Marconi Rev., vol. 15, pp. 97-113, 3rd Quarter, 1952. ABSTRACT: The importance of accurate ground calibration is emphasized, and a description is given of a combined compass base and D/F calibration site where no reinforcing steel is used. Bearings taken in the air wander more than those obtained in ground tests; the difference is attributed to the deviation of the aircraft from the even-keel attitude. Operational tests indicate that an accuracy within ±2° can be achieved if proper attention is paid to details. Correct design and location of the sense antenna are important if the D/F indicator is to reverse immediately above a radio beacon. (a-6, b-1, c-1, d-5, e-0, f-Error analysis)

3315. WAIT, J. R., "Electromagnetic Fields of a Current Carrying Wire in a Conducting Medium," Canad. J. Phys., vol. 30, No. 5, pp. 512-523; September 1952. ABSTRACT: Electromagnetic field components of linear currents carrying wires in a conducting medium are investigated. It is hoped the results will be applicable to electrical well logging methods. Formulas are derived for the field components for a linear wire carrying a sinusodal current imbedded in an infinite homogeneous and conducting medium. It is shown that the cylindrical insulted covering for the wire does not alter the field appreciably. Calculations are made for an insulated vertical current carrying wire placed in a horizontal conducting slab where the lower region is highly conducting and where the lower layer is a good insulator. Mutual impedance is determined between a vertical grounded wire in the slab and a horizontal wire element of the same length on the surface of the slab. Graphs are constructed with freq against impedance for a homogeneous conducting half-space and also for the two additional cases where the slab is terminated by a high conducting and a highly insulating lower medium. (a-1, b-1, c-1, d-7, e-0, f-Analytical investigation)

3316. FURLOW, W. M. Jr., AND BENKLEY, F. G., "Multisignal UHF Direction Finder," Melpar, Inc., Interim engineering rept. no. 14, 14 July-13 August 1952, TIP No. R7192; 3 September 1952. ABSTRACT: The dielectric constant of Araldite was established as 3.15 at 300 mc. Du Pont paint no. 4817 gave excellent adhesion and conductivity when used in the commutator lines. Fabrication of the antenna tower was begun. A photographic record of indicator patterns illustrated the improvement effected by limiting the input signal. (a-3, b-1, c-1, d-1, e-0, f-Report. See Abstract No. 3308)

3317. SMITH, E. K., "The Effect of Sporadic E on Television Reception," U. S. National Bureau of Standards, Report No. 1907; 8 September 1952. ABSTRACT: A study of 466 reports of high and low band television reception greater than 200 miles shows both ionosphere and troposphere propagation. A rather clear line may be drawn between the two, however. The distribution of reports with distance indicates that those with transmission paths between 200 and 500 miles are tropospherically propagated, whereas those between 500 and 1500 miles are propagated by single hop reflection from the sporadic E region of the ionosphere. (a-5, b-3, c-1, d-1, e-253, f-Study: propagation)

3318. BEAM, R. E. AND ANDRIS, P., "Input Impedance of Folded-Dipole Antennas," Proc. NEC (Chicago), vol. 8, pp. 678-691; October 1952. ABSTRACT: A general expression for the input impedance is derived in terms of the self- and mutual-radiation impedances and transmission-line impedances of the two conductors forming the folded dipole. Integral-equation methods are used to determine approximate values of the radiation impedances for sinusoidal current distribution. Experimental and theoretical curves representing the resistive and reactive components of the input impedance as functions of frequency are given for two folded dipoles, one with both conductors of 7/8-in. Cu tube and the other with fed elements of 3/8-in. tube, the rest being 7/8-in. In some cases the gap capacitance at the feed point was taken into account in the calculations. (a-5, b-1, c-1, d-1, e-0, f-Theory)

3319. WAIT, J. R., "The Magnetic Dipole Antenna Immersed in a Conducting Medium," Proc. IRE, vol. 4, pp. 1244-1245; October 1952. See also Proc IRE, No. 39; February 1953. ABSTRACT: Explicit expressions for the fields are derived for a magnetic dipole at the center of a spherical insulating cavity in a conducting medium such as sea water. An expression for the total power radiated is given for the case when all displacement currents in the conducting medium are negligible. (a-2, b-1, c-1, d-1, e-0, f-Theory)

3320. BRAMSLEV, G., "Loop Aerial Reception," Wireless World, vol. 58, pp. 469-472; November, 1952. ABSTRACT: The advantage in using a loop aerial to reduce noise in a receiver on long waves is described. Noise due to local power cables or electrical equipment is worse on long than on short waves, and it is the induction effect on an aerial in close proximity rather than a radiation field which causes the interference. Loop directivity can be used to discriminate against these magnetic fields provided thay make a sufficient angle with the desired radio waves. Normal capacitive aerials respond more strongly to electric than to magnetic fields and interference caused by electric appliances is known to be a predominantly electric field. This field being more or less vertical can be balanced out to earth when a loop aerial is used. Figures are given showing that a particular indoor aerial gave a noise level of 21 db below signal, whereas a loop gave 39 db below. Formulae are given for determining the size of the loop and its optimum inductance and tuning capacitance. (a-2, b-1, c-1, d-5, e-0, f-Evaluation)

3321. GUERTLER, R. "Folded Dipoles of Two or More Elements," Proc. Instn. Radio Engrs., Australia, vol. 13, no. 11, pp. 389-392; November 1952. ABSTRACT: Formulae previously derived are developed to give the impedance transformation of folded dipoles having two, three or four elements. Design charts based on the formulae are presented. (a-3, b-1, c-1, d-11, e-0, f-Theory)

3322. ANONYMOUS, "Antenna AT-269 (XA)/ARN-6A," Bendix Aviation Corporation, Baltimore, Maryland, Interim Engineering Report, Contract No. AF 33(038)23678, ASTIA No. AD-2936; 30 November 1952. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e, 0, f-Progress report)

3323. ANONYMOUS, "Modification Kit for Instantaneous Direction-Finder Display," Bendix Aviation Corp., Baltimore, Maryland, Interim engineering rept. no. 104, Contract No. AF 30(602)208, ASTIA No. AD-8821; December 1952. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Progress report)

3324. CARTER, P. S., "High-Frequency Airborne Direction Finding," Stanford Research Institute, Palo Alto, California, Aircraft Radiation Systems Laboratory. See Department of Commerce PB113792, ASTIA AD-10-018; December 1952. ABSTRACT: The antenna problem in

airborne direction finding is defined and studied in the frequency range of 2 to 30 Mc/s. A conventional loop direction-finding installation is studied for the presence of bearing errors and direction-finding pattern distortions. A method for improving the direction-finding behavior, which involves the use of balanced loops above and below the wing surface, is examined experimentally, and is shown to have improved properties over those of the conventional installation. The difficulties present in direction finding when sky-wave transmission is important are discussed, and possible solutions of the problem are examined. Contract no. AF 19(604)-266. SRI Proj. 591, Technical report no. 30. (a-3, b-3, c-1, d-1, e-0, f-RDF)

3325. GABLER, H., GRESKY, G., AND WACHTLER, M., "Quantitative-Investigation of the Increased Accuracy of Direction Finding using the C.R. Direction Finder," Arch. Elekt. Ubertragung, vol. 6, pp. 507-513; December 1952. ABSTRACT NO. 1: Report of a comparison of goniometer and CRO equipment, carried out on board the research ship Gauss during August, 1952. Measurements are tabulated and discussed. The CRO equipment is preferred on account of its objective indication and greater accuracy (viz., to within ±1°) especially at low field strengths and in the presence of interference. ABSTRACT NO. 2: An experimental comparison was made between a direction finder of the goniometer type and a recently developed instrument with direct indication on a cro screen. Particular attention was given to weak-signal performance and to the effect of interference from unwanted transmitters. The advantages of the direct-reading equipment as regards ease of manipulation, accuracy (usually to within ±1°), interference and performance on weak signals, are noted. (a_1-3, a_2-5, b-1, c-4, d-4, e-0, f-Study)

3326. WAIT, J. R., "The Electrical Fields of a Long Current Carrying Wire and Stratified Earth," J. geophys. Res., vol. 57, p. 481; December 1952. ABSTRACT: A numerical solution is given for the problem of a long insulated wire carrying a uniform oscillating current over a stratified earth with a highly conducting lower layer. The resultant electric field parallel to the wire is shown to be influenced to an appreciable extent by the presence of a conducting zone at a depth of 500 meters for a frequency of 500 cps. (a-5, b-1, c-1, d-1, e-0, f-Theory)

1953

3327. AL'PERT, Y. L., GINZBURG, V. L., AND FEINBERG, E. L., "Radio Propagation," Gos. Izdat. Tekhniko-Literatury; 1953. ABSTRACT: 883 pages, 124 tables, and 373 references. (a-4, b-6, c-2, d-2, e-0, f-0)

3328. BŘÍZA, J., "Radiation and Efficiency of an Imperfectly Terminated Rhombic Aerial," Slaboproudý Obzor, vol. 14, no. 11, pp. 464-480; 1953. ABSTRACT: The system considered was proposed by Neiman (1939) and Aizenberg (1948). It consists of a rhombic aerial (radiator) and a return line, instead of a load, which feeds the unradiated power back to the input of the radiator. An exponential transforming line, T_1, is inserted between the input of the radiator and the output of the return line, a similar exponential transformer, T_2, being connected between the output of the feeder and the input of the combination: return line and T_1 + aerial. Perfect matching of the system can only be achieved at one frequency. The author investigates approximately the effects of mismatch, which occurs at the sides of the working frequency band. Expressions for the radiation field and efficiency are derived and the vertical and azimuthal polar diagrams are plotted. It is found that for an aerial having a tilt angle ($\pi/2$) - 22° working in the band (ℓ/λ) = 2.5 + 7.5 where ℓ is the length of each side of the rhomboid and λ the wavelength, the magnitude of the maximum of the main lobe (m. l.) changes only a few %, its direction being practically unchanged; the magnitude of the maximum of the back lobe increases several times. The power efficiency of the system decreases by several %, while its working efficiency varies periodically within a few %, the latter being defined as a quotient of the power efficiency to the squared ratio of the electromagnetic field of an incorrectly terminated aerial measured in the direction of the maximum of the m. l. to that of a perfectly matched aerial. (a-2, b-1, c-19, d-19, e-0, f-Rhombic antenna)

3329. BYATT, D. W. G., "Effective Polarization on Elevated Aerial Direction Finders," Marconi Rev., vol. 16, no. 110, pp. 128-133; 1953. ABSTRACT NO. 1: Shows that the polarization of the field at an elevated direction finding aerial is not always the same as the polarization of the source transmitter and that, in general, no simple standard wave error can be quoted. ABSTRACT NO. 2: Reference made to determination of standard wave error which is recognized measure of polarization quality of U-Adcock or similar type of direction finder; it is shown that polarization of field at elevated direction finding antenna is not always same as polarization of source transmitter and that, in general, no simple standard wave error can be quoted. (a_1-2, a_2-3, b-1, c-1, d-5, e-0, f-Description and analysis)

3330 DUFOUR, J., "Reception Diagrams of Rhombic Aerials in a Vertical Plane," Tech. Mitt. PTT, vol. 31, no. 3, pp. 65-72; 1953 ABSTRACT: Two rhombic aerials were studied at frequencies of 6-30 Mc/s. An aircraft carrying a transmitter flew over the aerials in their axial directions. Photographs of the ground and of airborne instruments synchronized with short breaks in transmission served to locate the aircraft at various stages of the measurement. There was good agreement between measured and theoretical diagrams. (a-2, b-1, c-3, d-13, e-0, f-Rhombic antennas)

3331. MANWARREN, T. E., "A Study of Directional Antenna Systems for Radio D/F Purposes," Syracuse University, Institute of Industrial Research, Supplement No. 2 to Final Report on Task No. EE-22, ASTIA AD-37 505; 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3332. MORISON, S. E., New Guinea and the Marianas, March 1944-August 1944, History of United States Naval Operations in World War II, Volume VIII, Little, Brown and Company, Boston; 1953 ABSTRACT: Describes HF/D/F use in the Pacific during World War II. For instance on page 251, ... "a dispatch from Admiral Nimitz giving the result of high-frequency direction-finder bearings on the enemy force. HF/D/F stations had been established in the Aleutians, at Pearl Harbor, and elsewhere. These measured the directions of incoming enemy radio transmissions, and bearings from two or more stations could thus fix a transmitter's position, often within 100 miles. Ozawa had broken radio silence to ensure maximum cooperation from his land-based planes at Guam and elsewhere. This enabled American HF/D/F stations to locate him near lat. 13°N, long. 136°E, at 2023. Actually he was not more than 40 miles from that position; about 300 miles WSW of the spot where the American Fleet, at 2030, reversed course." " For an hour, Spruance discussed this proposal with his staff. Half an hour after midnight he rejected it. One factor in his decision was this: about an hour earlier his communications watch had intercepted and placed in his hands a dispatch from Admiral Lockwood (at Pearl Harbor) to submarine Stingray, stating that he had been unable to read one of her messages owing to radio jamming. Actually it was only a routine report, and the enemy was not jamming. Spruance's staff, cognizant of Stingray's patrol area, estimated her position then to be lat. 12°20'N, long. 139°E. This was about 175 miles ESE of the HF/D/F fix on Ozawa. Spruance, entertaining the possibility that Stingray's unreceived message was a contact on the enemy fleet, which in that event would be much nearer his forces than the HF/D/F fix indicated, decided to continue his easterly course during the night. At 0038 June 19 he so informed Mitscher: - Change proposed does not appear advisable. Believe indications given by Stingray more accurate than that determined by direction-finder. If that is so continuation as at present seems preferable. End run by other carrier groups remains possibility and must not be over-looked." Note this "end run," which figures so largely in discussions of the battle. Admiral Spruance was as eager to close with the enemy as anyone, but at the same time he was deeply inpressed with the sacredness of his assigned mission. "We were at the start of a very large and important amphibious operation and we could not gamble and place it in jeopardy. The way Togo waited at Tsushima for the Russian Fleet to come to him has always been in my mind. We had somewhat the same basic situation." Moreover, Spruance had in his hands a translated Japanese document sent to him by MacArthur: a manual of enemy carrier doctrine, it seems, in which Japanese carrier force commanders were recommended to feint in the center, engaging their enemy's undivided attention, while sending detachments around his flanks to execute a pincer movement. That is exactly what the Japanese had done at Coral Sea and in the battles around Guadalcanal, and what they had attempted to do at Midway, where Spruance defeated them by destroying their carrier-force center before the flanks could close. Knowing how tenaciously the Japanese clung to their strategic concepts - and they would try this one again at Leyte Gulf - Spruance had good reason to expect an "end run." He had to take into account the possibility that the transmission picked up by HF/D/F might be from an enemy ship located off the main course with intent to deceive, and that Stingray had detected a Japanese force trying to sneak around his southern flank to get at Saipan. Moreover, the translated Japanese document suggested that a similar movement might be made on the American northern flank by another enemy force coming down from Okinawa or Japan. Spruance's estimate was clearly wrong; and it is singular that he should have placed greater value on remote inferences from the Stingray business than on HF/D/F. He is not to be blamed for assuming that the Japanese would divide their forces. But no reinforcements were coming south from Japan, and

Ozawa had no intention of trying an end run. That rugged Japanese sea dog was carefully selecting a position from which he could inflict maximum damage by a straight-from-shoulder punch, with all his strength behind it. The situation was almost the reverse of that on another bright June morning two years earlier, when the Battle of Midway was coming up. Ozawa knew where Spruance was, and had made every preparation to strike the first blow, but Spruance as yet had no certain intelligence of Ozawa's position and movements. He was as much in the dark as Admiral Nagumo had been in the early morning of 4 June 1942, when Spruance and Fletcher had learned his position from a patrolling Catalina. At 0150 June 19, after making the decision to continue eastward, Spruance received Finback's report of searchlights well northeast of the HF/D/F fix. But it seemed strange for a force to turn on searchlights when seeking the enemy; could not this be another ruse? The Admiral saw no reason to reconsider, and TF 58 continued eastward. He did not know that, at 0115 June 19, one of the Garapan-based PBMs, searching 600 miles out of Saipan on the W to WSW sector, had made a very significant radar contact. The PBM's screen registered 40 fighting ships, disposed in two groups, and the position was only 75 miles NE of the HF/D/F fix. Old "Huff-Duff" had made no mistake! This report, if received promptly, might well have caused Admiral Spruance to reconsider; for he knew from Intelligence sources how many ships Ozawa had, and the PBM's report accounted for nearly that number. His staff could have figured out that at 0200 the two Fleets were a little more than 300 miles apart, which meant that if Spruance had then doubled back, and Ozawa had kept coming, Mitscher would have been within easy striking radius by daybreak." Further discussion of this event is given on pages 278 and 285, the latter mentions Japanese radio silence to prevent HF/D/F. (a-4, b-6, c-1, d-1, e-0, f-Material quoted with permission of the publisher)

3333. HANDEL, P. VON, "Peilung," ("Direction-Finding,"), Natural Science and Medicine in Germany, 1939-1946, Part II, Section 12, pp. 173-187; 1953. Edited by G. Goubau and J. Zenneck. ABSTRACT: Not available. (a-4, b-6, c-4, d-4, e-0, f-Survey and reference)

3334. MORITZ, K., "Calculation of the Attenuation and Distortion of Travelling Waves," Arch. Elektro-tech., vol. 41, pp. 160-180; 1953. ABSTRACT: Mathematical investigation of the propagation of a voltage pulse along a line with an earth return. The losses due to eddy currents and corona are taken into consideration; line resistance losses are neglected. (a-3, b-1, c-4, d-4, e-0, f-Experimental study)

3335. PLEBANSKI, J., "Improvement of Directional Characteristics and Other Applications of the Rotating Field," Przeglad Telekom., no. 2, pp. 49-59; 1953. ABSTRACT: A continuation of earlier papers by the author. A method is described enabling the spacing between arrays of aerials to be reduced to half of that normally used, and to eliminate the side lobes. The phase differences depending on the direction are increased, and it is possible to rotate the field pattern, with the help of a goniometer, by 0° to 360° without change in the shape. A few possible applications are indicated. (a-2, b-1, c-22, d-22, e-0, f-Description)

3336. RABURN, L. A., "Faired-in a.d.f. Antennas," Convention Record of the Inst. Radio Engrs., 1953, Pt. 1, pp. 31-38. ABSTRACT: The a.d.f. gives radio direction-finding in the frequency band 100-1750 Kc/s using loop and sense aerials. A study has been made of the effects of fitting the loop aerial in a recess in the fuselage. The effects of recess shape are considered. Experiments show that the errors of external and recessed loop installations on any one aircraft site are much the same and therefore a satisfactory site for a recessed loop can be found by testing an external loop in various positions on the aircraft. The effects of loop positioning are discussed. A method of inductor compensation is described. (a-2, b-1, c-1, d-1, e-0, f-Description)

3337. SHINN, D. H., AND WATSON, D. W., "Octantal Error in Phase to Amplitude Conversion Circuit," Marconi Rev., vol. 16, no. 110, pp. 121-127; 1953. ABSTRACT: Analysis of inherent error which results from use of circuit employed in Marconi vhf Type A.D. 200 direction finder; formulas are derived showing its magnitude and nature; error is dependent on ration of amplitudes of two input voltages; it is substantially octantal in form and is arranged to cancel most of the octantal error due to antenna spacing. (a-3, b-1, c-1, d-5, e-0, f-Error analysis)

3338. STROM, JR., C. A., AND FANTONI, J. A., "Application of Integrator-Type Signal Enhancers to Direction-Finding Equipments," Convention Record of the Inst. Radio Engrs., 1953; Pt. I, pp. 7-12. ABSTRACT: The operational improvement of direction-finding stations using (a) Mg delay line, (b) magnetic storage drum and (c) capacitive storage drum was studied. The bearing quality for a given range was improved considerably as a result of this post-detector integration technique. (a-2, b-1, c-1, d-1, e-0, f-Modification description)

3339. ANONYMOUS, "Modification Kit for Instantaneous Direction Finder Display," Bendix Aviation Corporation, Baltimore, Maryland, Interim engineering report; January 1953, ASTIA AD-8822. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification. See Abstract No. 3323 for earlier citation: See Abstract No. 3412)

3340. LIEN, R. H., "Radiation from a Horizontal Dipole in a Semi-Infinite Medium," Jour. Appl. Physics, vol. 24, pp. 1-4; January 1953. ABSTRACT: Expressions for the electric field due to an oscillating horizontal dipole place in a semiinfinite dissipative medium have been derived for the case when the frequency is low. The main work involves the evaluation of some complex integrals which have been reduced to forms suitable for numerical computation. Correspondance on the above paper from James R. Wait in the July 53 Jour. Appl. Physics, points out that Lien neglects the displacement current in the air thus ruling out the possibility of a surface wave along the interface. He suggests another approximation which will avoid the difficulty. (a-3, b-1, c-1, d-1, e-161, f-Theory)

3341. REYNOLDS, L. G., "An Examination of Some Site and Transmission-Path Errors of the Decca Navigator System When Used over Land," Proc. IEE (London), Part III, vol. 100, pp. 29-35; January 1953. ABSTRACT: The results of measurements of the Decometer errors near obstacles such as trees and telegraph wires are described and discussed. Vertical obstacles were found to show some uniformity as regards to their effects, but the effects of long horizontal conductors were very variable. Errors determined at good sites on the base-line extensions of the red and green lattices are shown graphically and exhibit the effects of the near-field components and the finite conductivity of the ground. Good agreement is obtained between the mean of the observations and a composite theoretical curve based on Norton's plane-earth theory and Bremmer's curved-earth theory of groundwave propagation. (a-5, b-1, c-1, d-5, e-491, f-Description)

3342. SPATUZZA, G., "Utilizzazione dei rilevamenti radiogoniometrici nelle carte di navigazione," Revista Aeronautica, vol. 29, no. 1, pp. 37-45; January 1953. ABSTRACT: (Utilisation of radio bearings on navigational charts; problems in use of bearings from RDF ground station as distinct from airborne RDF system; graphical method using Lambert or polar stereographic charts, which minimises uncertainty of distance and position at high latitudes. (a-3, b-1, c-9, d-9, e-0, f-RDF navigation and bearing technique)

3343. WAIT, J. R., "Receiving Properties of a Wire Loop with a Spheroidal Core," Canad. J. Technol., vol. 31, pp. 9-14; January 1953. ABSTRACT: The relative gain of a l.f. loop aerial is calculated for a spheroidal-shaped core. The case considered are where the loop is coaxial and where it is at right angles to the spheroid axis of symmetry. The core losses are assumed to be negligible. It is shown that elongated cigar-shaped and flat dish-shaped cores can utilise effectively the magnetic properties of modern ferro-magnetic materials. (a-2, b-1, c-1, d-7, e-0, f-Loops)

3344. KEARNEY, J. W., AND DESIZE, L. K., "Airborne Instantaneous Intercept Receiver," Airborne Instruments Lab., Incorporated, Mineola, New York, Interim engineering report no. 844-I-15, ASTIA AD-12 734; 2 January 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3345. EATON, J. E., "Extension of the Luneberg-Type Lenses," USN, NRL Report No. R4110. See also Department of Commerce PB111147; February 1953. ABSTRACT: The spherical lens first investigated by Luneberg, for which scanning throughout space without distortion is possible, has been generalised to permit the source to lie within the lens, thereby reducing the size of the path followed by the source in scanning. This, and other spherical lenses with complete spherical symmetry that simulate line sources and infinite plane reflectors, appear as special cases of an extension of the class of circularly symmetric circular lenses due to Luneberg. Luneberg considered only the case in which the real and apparent sources were located at diametrically opposite points outside the lens. (a-3, b-3, c-1, d-1, e-0, f-Study and analysis. See Abstract No. 3367)

3346. REESE, R. F., "Radio Compass Flush-Mounted Sense Antenna Installation in The Boeing B-47 Aircraft," Boeing Airplane Company, Seattle, Washington, Final Report; February 1953, ASTIA No. AD-64 228. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3347. ELGHOZI, G., "A Problem of Radio Direction-Finding Ionospheric Anisotropy," Ann. Telecommun., vol. 8, pp. 78-92; March 1953. ABSTRACT: The theories of Booker and Al'pert on the magneto-ionic effect are outlined and their formulas for the resulting lateral deviation of EM waves are compared. The methods of calculation involved are equivalent; if the results obtained are not the same, this may be due to differences between the values of the parameters occurring in the formula. These parameters include frequency, distance, azimuth of the initial plane of the wave, inclination of the geomagnetic field, value of the MUF. Their number precludes individual analysis. Several simple cases are, however, treated by Booker's method; the order of magnitude of the lateral deviations to be expected is determined and the conditions are found which the parameters must satisfy for the deviations to be appreciable. (a-3, b-1, c-3, d-3, e-0, f-Theory)

3348. STRINGER, F. S., "An Account of Experiments to Determine Homing and Direction-Finding Performance of British Compass (A.R.I. X303A)," Royal Aircraft Establishment (British), Technical Note No. RAD 541, CRB No. 53/1317, ASTIA No. AD-12 555; March 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Evaluation report)

3349. WAIT, J. R., AND CAMPBELL, L. L., "The Fields of an Electric Dipole in a Semi-Infinite Conducting Medium," Journal of Geophysical Research, vol. 58, no. 1, pp. 21-28, March 1953. ABSTRACT: The behavior of an electric dipole situated above a semi-infinite conductor is investigated. Expressions for the electric and magnetic fields within the conductor are derived for the case that significant distances are much less than a free space wave-length. Curves are plotted which show the dependence on conductivity, frequency, and position of the observer. The application of the results to propagation in sea-water is indicated. (a-5, b-1, c-1, d-1, e-0, f-Study)

3350. WAIT, J. R., "A Transient Magnetic Dipole Source in a Dissipative Medium," Jour. Appl. Phy., vol. 24, no. 3, pp. 341-343; March 1953. ABSTRACT: The solution is given for the electric field of a small current carrying loop which is immersed in a dissipative medium and is energized by a step function current. Approximate expressions for the magnetic fields are also derived. The propagation of an electromagnetic pulse is discussed for sea water as a medium. (a-5, b-1, c-1, d-1, e-0, f-Theory)

3351. ANONYMOUS, "Final Report," Andersen Labs., Inc., West Hartford, Conneticut, Contract No. AF 28(099)67, ASTIA AD-9544; 1 March 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3352. BOHNENSTENGEL, H., "The Rhombus as a Receiving Aerial," Fernmeldetech. Z. (FTZ), vol. 6, pp. 172-178; April 1953. ABSTRACT: The design of rhombic receiving aerials is discussed, fundamental theory being applied to determine optimum parameters for aerials for reception of horizontally polarized waves and of waves whose direction of polarization is variable. Vertical-plane diagrams are calculated for the "standard" rhombic aerials used at Luchow. The overall length of these is 96 m, apex angle 40° and height 20 m. Diagrams are also given for a shortened "standard" aerial of length 65 m. The general theory presented stresses the importance of the horizontal dimensions, if radiation polarized either horizontally or vertically is to be received approximately equally well. A reflection-free connection to the feeder cable at the apex of the rhombus is necessary, and the aerial characteristic impedance should be as uniform as possible, a multi-wire construction being preferable. (a-2, b-1, c-4, d-4, e-0, f-Rhombic antenna)

3353. PORTER, Q. J., "Precipitation Static Evaluation of a Relocated AN/ARN-6 Radio Compass on B-47 No. 51-2046," Communication and Navigation Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, Report No. 53-144, ASTIA No. AD-26 445; April 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

3354. CHANEY, J. G., "Free Space Radiation Impedance of Rhombic Antenna," J. Appl. Phys., vol. 24, pp. 536-540; May 1953. ABSTRACT: The expression for the driving point impedance of a generalized electric circuit as visualized by the author is partially integrated, and the physical significance of certain terms is discussed in connection with their application to aerial problems. Upon postulating an unattenuated travelling wave as a first approximation to the current along either a terminated rhombic or Vee aerial a formula is derived for the free space radiation impedance of each. The expression radiation impedance is used for that portion of the driving point impedance which may be determined from the complex power into the external fields. The resistive component of the impedance for the rhombic aerial agrees with the radiation resistance as quoted by L. Lewin in a discussion of a paper by D. Foster, with Lewin apparently obtaining his formula by the solid angle Poynting vector method. (a-2, b-1, c-1, d-1, e-0, f-Theory)

3355. DUHAMEL, R. H., "Optimum Patterns for End-Fire Arrays," Proc. IRE, vol. 41, pp. 652-659; May 1953. ABSTRACT: The optimum design methods of Dolph and Riblet for the broadside array with an odd number of elements have been modified so that a common design procedure may be used. This procedure was then extended to the endfire array with an odd number of elements. A comparison of the optimum and other designs for endfire arrays is then given. In the design of a linear array to produce a beam pattern, it is quite important that the beam be as narrow as possible and the side lobe level be quite low. During recent years many papers have appeared on the problem of designing a linear array to produce a specified pattern. Specifically, the synthesis of the optimum pattern for a broadside array has received considerable attention. Dolph devised a method of synthesizing an optimum pattern for a broadside array of isotropic elements spaced a half-wavelength or greater. Riblet later extended Dolph's method to include an array with an odd number of isotropic elements for which the spacing is less than a half wavelength. An optimum pattern is defined as a pattern for which the beam width is a minimum for a given side lobe level or, on the other hand, the side lobe level is a minimum for a given beam width. The optimum patterns are obtained from the Tchebycheff polynomials and hence will be referred to as either an optimum or a Tchebycheff pattern. An important and necessary property of the Tchebycheff pattern is that the side lobes are all equal. In a recent paper, Sinclair and Cairns have considered broad side arrays of non-isotropic sources. They established the mathematical conditions which the optimum polynomial must satisfy and gave approximate methods for deriving this polynomial. They also outlined a method of synthesizing the optimum pattern for a broadside array with an even number of isotropic sources when the element spacing is less than a half wavelength. Thus, the broadside array has received a rather complete treatment. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

3356. HOLBROOK, J. G., "Null Characteristics of the Rotating Adcock Antenna System," Jour. Appl. Phys., vol. 24, pp. 530-532; May 1953. ABSTRACT NO. 1: Mathematical analysis indicates that the optimum spacing of the dipoles for the most clearly defined non-multiple nulls approaches the value of the shortest wavelength for which the system is designed, whereas the usual practice is to adopt a $\lambda/2$ spacing. ABSTRACT NO. 2: It has been the usual practice when designing a rotating Adcock system to allow a spacing of $\lambda/2$ between opposite dipoles at the highest intended frequency of operation. A mathematical analysis of this aerial system is presented, and it is shown that an optimum spacing for the most clearly defined nonmultiple nulls approaches a full wavelength. Useful design formulae are developed and typical response curves are presented graphically. (a_1-5, a_2-5, b-1, c-1, d-1, e-0, f-Analysis)

3357. HOPKINS, H. G., "More on Direction Finders," Proc. IRE, vol. 41, pp. 548-549; May 1953. ABSTRACT: It is recommended that the term "unwanted" should be reserved for the component which introduces errors when the direction finder is operated on a uniform unobstructed site. The proposed distinction between primary and secondary errors is also criticized. (a-3, b-1, c-1, d-1, e-0, f-Comment regarding earlier article pertaining to RDF errors)

3358. VAN WEEL, A., "Radio Navigational Aids," Tijdschr. ned. Radiogenoot., vol. 18, pp. 129-148; May 1953. ABSTRACT: Survey of the basic principles and characteristics of (a) nondirectional beacons and radio compass, (b) radio range (c) instrument landing system, (d) directional beacons, (e) distance-measuring equipment, (f) loran and decca systems. (a-5, b-1, c-12, d-12, e-0, f-Survey)

3359. WAIT, J. R., "Radiation Resistance of a Small Circular Loop in the Presence of a Conducting Ground," J. Appl. Phys., vol. 24,

no. 5, pp. 646-649, May 1953. ABSTRACT: The solution is given for the total power flow from an oscillating magnetic dipole, situated above a flat homogeneous conducting ground and oriented in the vertical direction. The result is employed to derive an expression for the radiation resistance of a small wire loop whose axis is perpendicular to the ground. It is pointed out that for a finitely conducting ground the radiation resistance is very large when the height of the small loop or dipole is a small fraction of a wavelength. (a-2, b-1, c-1, d-1, e-0, f-Theory and analysis)

3360. ANONYMOUS, "Operational Evaluation of Low-Frequency DF Navigation," USN, Naval Air Test Center, Patuxent River, Maryland, Final Report, Project TED No. PTR EL-44027, ASTIA AD-12 983; 1 May 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation. Note: Another source denotes date as 5 November 1953)

3361. CHANEY, J. G., "Mutual Impedance of Rhombic Antennas Spaced in Tandem," J. Appl. Phys., vol. 24, pp. 751-755; June 1953. ABSTRACT NO. 1: Upon examining the formulae for self and mutual impedances of aerials, it is found that while the mutual impedance formula for separately driven collinear standing-wave aerials may be used directly in determining the radiation impedance when such aerials are connected in cascade, certain modifications must be made in the case of travelling-wave aerials under similar circumstances. Accordingly, formulae are derived for rhombic aerials spaced in tandem and are modified to permit the determination of the radiation impedance of two identical rhombic aerials connected in cascade. ABSTRACT NO. 2: The mutual impedance formula for separately driven collinear standing-wave aerials may be used directly in the determination of the radiation impedance of these aerials when connected in cascade, but modifications are necessary for the case of travelling-wave aerials under similar circumstances. Formulae are derived for two identical, coaxial and coplanar rhombic aerials in tandem. These formulae are considerably simplified for the case where the aerials are closely spaced and connected in series. (a_1-2, a_2-1, b-1, c-1, d-1, e-0, f-Rhombics)

3362. CHRISTIANSEN, W. N., AND WARBURTON, J. A., "The Distribution of Radio Brightness over the Solar Disk at a Wavelength of 21 Centimetres," I. A New Highly Directional Aerial System, Austral. J. Phys., vol. 6, pp. 190-202; June 1953. ABSTRACT: A new aerial system of very high resolving power has been designed for use in determining the distribution of radio brightness across the solar disk at a wavelength of 21 cm. Thirty-two aerials with paraboloidal reflectors are evenly spaced in an east-west direction over a distance of about 700 ft, and are connected by a branching system of balanced openwire transmission lines to a receiver. The aerial system produces multiple beams each 3' of arc wide and spaced 1.7° apart. The rotation of the earth causes one after another of the aerial beams to scan the disk of the sun. The record obtained from the radio receiver gives a one-dimensional brightness distribution over the solar disk. (a-2, b-1, c-1, d-11, e-0, f-Description)

3363. RHODES, D. R., "The Optimum Linear Array for a Single Main Beam," Proc. IRE, vol. 41, pp. 793-794; June 1953. ABSTRACT: For a linear array having any given number of elements it is shown that an optimum single beam endfire pattern can be produced by proper choice of current distribution and element spacing. The Dolph Tchebyscheff current distribution for a linear array produces the minimum beam-width possible for a given side lobe level when all elements are fed in-phase. For an array of dipoles, the requirement that all elements be fed in-phase results in two main beams in the broadside directions. For many array applications this can be reduced to a single main beam by placing a suitable reflector on one side of the array; however, it will be shown in this paper that a linear array exists for producing a single main beam from the array alone, with the minimum beamwidth possible for a given number of elements and side lobe level. The minimum beamwidth for a single main beam is always greater than that produced by Dolph's array, however. Two other principal differences will appear, namely that the optimum single-beam pattern is possible only for a certain specified spacing between elements, and that the single-beam pattern is endfire rather than broadside. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

3364. ANONYMOUS, "Laboratory and Flight Tests of AN/ARN-6 Control Panel Developed by Douglas Aircraft Corporation," USN, Naval Air Test Center, Patuxent River, Maryland, Report No. 1, ASTIA No. AD-16 869; 16 June 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3365. RUSSELL, J. H., "Evaluation of Pre-Production Induction Motors, G-M Laboratories, Inc., Part No. 665-51, for Use in Direction-Finder Group AN/ARA-25," Aeronautical Electronic and Electric Laboratory, Final Report, ASTIA AD-20 515; 25 June 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3366. GRAZIADEI, H., "A Solution for a Practically Frequency-Independent Transition between A H. F. Coaxial Cable and a Balanced H. F. Transmission Line," Fernmeldetech. Z., vol. 6, no. 7, pp. 311-319; July 1953. ABSTRACT: Feeder arrangements for rhombic transmitter aerials are considered. The theory of a wide band unbalance/balance impedance-matching transformer is given; design and applications are considered. A transformer consisting of a reactive loop and an exponential line in parallel with the output of a coaxial line has been designed to give a nearly level response over the 10-60-m band for a 60Ω/500Ω line impedance ratio. (a-3, b-2, c-4, d-4, e-0, f-Theory)

3367. PELLER, G. D. M., KELLEHER, K. S., AND COLEMAN, H. P., "Virtual Source Luneberg Lenses," USN, NRL Report No. 4194. See also Department of Commerce PB111221; July 1953. ABSTRACT: The portion of a spherical Luneberg lens contained between two plane reflectors has been investigated as a lens of reduced size and weight. (a-3, b-3, c-1, d-1, e-0, f-Study. See Abstract No. 3345)

3368. REESE, R. F., "An Electrolytic Tank Method for Low-Frequency Loop Antenna Studies," Aircraft Radiation Systems Lab., Stanford Research Institute, ASTIA AD-18 469; July 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

3369. WAIT, J. R., "The Radiation Fields of a Horizontal Dipole in a Semi-Infinite Dissipative Medium," J. Appl. Phys., vol. 24, pp. 958-959; July 1953. ABSTRACT: The calculations contained in an earlier paper (see: J. Geophys. Res., vol. 58, no. 1, pp. 21-28; March 1953) are extended by including the effects of the displacement currents in the insulating medium. (a-3 and 4, b-1, c-1, d-1, e-0, f-Theory)

3370. WILLIAMS, JR., R B., "Continuous-Indicating Loran Navigator," Electronics, vol. 26, pp. 166-169; July 1953. ABSTRACT: A 12-tube unit is added to the standard Sperry Mark-2 indicator to synchronize it with the received signals, maintain correct pulse amplitude as shown on the cr tube screen and maintain pulse superposition in height and time. Details are given of the circuits provided for age, automatic amplitude-balance control, pulse-amplitude sampling with time-sharing relay, afc, automatic time-difference control and pulse-position detection. The time-sharing relay is an em servo-type switch. One unit gives continuous indication of one line of position of the aircraft. Two units synchronized on separate pairs of stations give continuous indication of exact position. (a-5, b-2, c-1, d-1, e-0, f-Description)

3371. ANONYMOUS, "Laboratory and Flight Tests of Reworked AN/ARN-6 Control Panel Submitted by Douglas Aircraft Corporation," USN, Naval Air Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-16 864; 22 July 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3372. CHENG, D.K., AND GALBRAITH, R.A., "Stagger-Tuned Loop Antennas for Wide-Band Low-Frequency Reception," Proc. IRE, vol. 41, no. 8, pp. 1024-1031; August 1953. ABSTRACT NO. 1: Design calculations are made for an experimental 100 kc system which consists of 12 identical small loop antennas, arranged in two groups at right angles to each other and stagger tuned to different frequencies within the required frequency band. The outputs are applied to a squaring circuit and then added in a parallel-plate summing amplifier before being passed via a grounded-grid amplifier and a cathode-follower stage to the receiver. The system has a 3-db bandwidth of 16.5 kc. An electrolyte-tank method of analyzing the response of such systems is discussed in an appendix. ABSTRACT NO. 2: Describes a system of stagger-tuned high-Q loop aerials designed for 100 kc/s Loran pulse reception. The individual loop outputs are first added in a summing amplifier followed by a grounded-grid amplifier and a cathode-follower stage before being fed to the receiver. An experimental aerial array was developed, having a wide bandwidth with relatively small dimensions. A squaring scheme of obtaining an omnidirectional reception property is suggested; and a modified electrolytic tank method, which is adaptable to the present system in synthesizing a given response characteristic, is also described. (a_1-3, a_2-5, b-1, c-1, d-1, e-0, f-Description)

3373. HORNER, F., "Radio Direction Finding. Influence of Buried Conductors on Bearings," Wireless Eng., vol. 30, pp. 187-191; August 1953. ABSTRACT: The currents induced, at low frequencies, in a buried cable in good contact with the ground may greatly exceed those in a similar cable insulated from the ground. These currents may lead to large errors in a loop direction finder, even when the length of the cable is a small fraction of the wavelength. The errors are likely to be small if the direction finder is near one end of the cable. Formulas are derived for the currents induced in a buried conductor and these lead to calculated errors in reasonable agreement with measured errors, at a frequency of 10 kc. The results show that the effect of burying a cable in soil of good conductivity is to increase errors at low frequencies and to reduce errors at high frequencies. The transition frequency depends on the length of the cable and is, for example, about 300 kc for a cable 200 meters long. Adcock direction finders are less liable to errors due to cables, but there is some risk of errors if a cable is laid in close proximity to an antenna feeder. (a-1, b-1, c-1, d-5, e-770, f-Analysis)

3374. ANONYMOUS, "Development of a Small Console Control Unit to Replace the C-758/A and C-685/ARA-19 Control Units for AN/ARN-6 Radio Compass Equipment," Aeronautical Electronic and Electrical Laboratory, Naval Air Development Center, Johnsville, Pennsylvania, Final Report, ASTIA No. AD-36986; 24 September 1953. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-Report)

3375. BAIN, W. C., "The Calculation of Wave-Interference Errors on a Direction-Finder Employing Cyclical Differential Measurement of Phase," Proc. IEE, Part III, vol. 100, pp. 253-260; September 1953. ABSTRACT: Considers the evaluation of errors on a wide-aperture type of direction-finder. The errors considered are those due to the wave interference between two rays incident on the aerial system, such as may be produced in ionospheric propagation. Expressions are derived for the mean-square error taken over all phase relations of the down-coming rays, and also over a distribution in bearing of the smaller of the two rays. In all cases a comparison is made with the corresponding figures for an Adcock direction-finder. It is suggested that, for the D/F system discussed, an aperture of four wavelengths would be sufficiently large to give a useful reduction in the component of error variance due to wave interference, over that obtained with an Adcock direction-finder. (a-1, b-1, c-1, d-1, e-465, f-D/F errors-Doppler, Wave interference, study and analysis)

3376. BANOS, A., AND WESLEY, J.P., "The Horizontal Electric Dipole in a Conducting Half-Space," Part I, University of California, Marine Physical Laboratory, Scripps Institution of Oceanography, sponsored by Bureau of Ships, Contract NObsr-43356, NE-120221-5, September 1953. ABSTRACT: This report gives a thorough and complete account of the mathematical problems involved in the determination of the electromagnetic field components generated by a horizontal electric dipole embedded in a conducting half-space. The problem is formulated by introducing the Hertzian vectors or polarization potentials and employing the technique of triple Fourier transforms in Cartesian coordinates, in configuration space as well as in transform space. Suitable integral representations are obtained for the components of the Hertzian vectors. It is shown that this formulation is fundamental in the sense that it contains 'per se' all other known formulations of the problem. Thus, by suitable transformations of the variable or variables of integration one readily obtains the formulations of Sommerfeld (1909), Weyl (1919), Ott (1942), etc. Further, by correctly specifying the original path of integration in Sommerfeld's formulation of the problem and by carefully analyzing the class of permissible deformations of the original path, the whole moot question of poles and residues is clarified in a straightforward manner. The report also presents the complete independent solution of the static problem and it is shown that all solutions for the alternating case converge uniformly to the static solutions as the frequency is made to vanish. Further, the static solution is applied to an extended source pointing out the way for a similar extension of the alternating dipolar solution. The Cartesian components of the Hertzian vectors and the cylindrical components of the field vectors (E and H) are given, for both media. It is shown that there are two distinct asymptotic contributions arising from two saddle points and the notable feature of the results is that one of the saddle points yields a solution which is not exponentially attenuated in the horizontal direction in accordance with known experimental results. Thus, the possibility of large ranges of the field in the horizontal direction at depths which are not too great is clearly established. (a 1, b 3, c-1, d-1, e-281, f-Lengthy analysis but see Part II, Baños, August 1954; Abstract No. 3425)

3377. BLOCH, A., MEDHURST, R.G., AND POOL, S.D., "A New Approach to the Design of Super-Directive Aerial Arrays," JIEE, vol. 100, Part III, no. 67, pp. 303-314; September 1953. ABSTRACT: The current distribution required for maximum directivity of an array with a finite number of elements and any specified geometrical configuration is shown to be completely defined by the self- and mutual resistances of the elements and by a certain component of the voltage (the "resistance voltage") across the terminals of each element. This voltage component is required to vary from element to element in the same way as the instantaneous local values of a sinusoidal disturbance travelling across the array, in the direction under consideration, with the velocity of an electromagnetic wave. As a consequence, the maximum gain of the array is expressible either as a double sum containing only the mutual conductances between the individual elements multiplied by trigonometrical factors depending on their spacing, or as an expression identical (except for a numerical factor) with that for the distant field of the array. These theorems hold, slightly modified, for arrays of non-identical elements. The theory has been applied to the numerical calculation of certain simple arrays. It appears that, for arrays of a given size, directivities greater than those obtained by conventional design methods can be achieved without excessive losses. This has been substantially confirmed by an experimental array of four elements operating at 75 Mc/s. The theoretical gain was 10.1 db, while 8.7 db was measured. Of the discrepancy, 0.6 db was calculated to be due to losses in the feeder system and a further 0.2 db to losses in the dipoles. The bandwidth was about ± 1/2 Mc/s for a drop in gain of 1/2 db. The degree of super-directivity is indicated by the fact that a physically identical array fed with equal-amplitude currents phased for maximum field strength in the end-fire direction would have a gain of 4.6 db. (a-1, b-1, c-1, d-5, e-468, f-Theoretical and experimental results report)

3378. HOPKINS, H.G., AND BRAMLEY, E.N., "Some Practical Measurements of the Relative Performances of a Cyclical Phase-Comparison Type of Direction-Finder and a U-Adock Instrument," Proc. IEE, Part III, vol. 100, pp. 263-267; September 1953. ABSTRACT: Simultaneous bearing observations were made using a cathode-ray direction-finder of the U-Adcock type and a multi-aerial wide-aperture instrument (PV2) employing cyclical differential measurement of phase. The transmitters observed operated in the frequency band 8-12 Mc/s and were located at distances ranging from 750-1500 km. In the analysis of the data, where particular attention was paid to the rapidly varying component of the bearing changes, it was found that for the majority of the transmitters studied, the spread of bearings was significantly greater with the Adcock than with the other direction-finder. The reasons for this difference are discussed and it is inferred that a large part of the superior performance of the PV2 was due to its relatively large aerial spacing. Although the Adcock instrument gave the better performance in the presence of interfering signals, a higher proportion of observations were lost with it owing to deep fades. (a-2, b-1, c-1, d-5, e-464, f-Evaluation report)

3379. INOUYE, G., "Polarization of Radio Waves Reflected from the Ionosphere at Nonvertical Incidence. II: Measurement Techniques and Experimental Results," Harvard University, Cruft Laboratory. See Department of Commerce PB114313; September 1953. ABSTRACT: Appendix A: Measurement of ground constants. - Appendix B: Bandwidth, rise-time, and time-delay relations in a synchronously tuned cascaded amplifier. 1. Radio waves - Polarization 2. Radio waves - Polarization - Measuring equipment 3. Radio waves - Reflection - Ionosphere 4. HU CL TR 191. (a-4 and 3, b-3, c-1, d-1, e-0, f-Propagation)

3380. MILLINGTON, G., AND THACKRAY, J.C., "Ground Wave Propagation Curves for Frequencies from 150 Kc/s. to 10 Mc/s.," Marconi Rev., vol XVI, no. 110, p. 109; September 1953. ABSTRACT: A new set of ground-wave propagation curves is given for frequencies from 150 kc/s to 10 Mc/s with field-strength plotted in decibels relative to 1 μV/m against frequency on a logarithmic scale for contour values of distance. They are calculated for vertical polarization with transmitting and receiving aerials on the ground and correspond to an unattenuated field of 3×10^5 d/μV/m that would be obtained at a distance d kilometres, over a plane perfectly conducting earth. Curves for five earth conductivities are given: 4×10^{-11} emu, for propagation over sea, and $10^{-12.5}$, 10^{-13}, $10^{-13.5}$ and 10^{14} emu for propagation over various types of land. A brief account is given of the method of calculation and of the care taken to make the curves internally consistent. (a-1, b-1, c-1, d-5, e-744, f-Theoretical curves)

3381. MILLS, B.Y., AND LITTLE, A.G., "A High-Resolution Aerial System of a New Type," Austral. J. Sci. Res., Series A, vol. 6, pp. 272-278; September 1953. ABSTRACT NO. 1: Description of the original Mills Cross. ABSTRACT NO. 2: A method of constructing an aerial system of high resolution but small area and low cost is described. Its application to the production of narrow pencil beams

at metre wavelengths for investigations in radio astronomy is discussed. A small-scale model has been constructed to test the principle. Recent studies of cosmic radio-frequency radiation have shown that its brightness distribution over the sky is complex. Sources of an angular size less than about 1/4° have been known to exist for some years and, now, extended sources of considerably greater size have been observed (Bolton 1952; Mills 1952), some of which appear to merge with the general background radiation. Interferometric methods, which were so useful in the early days of radio astronomy, have encountered serious difficulties when used for observing such a complex distribution. It therefore appears desirable to rely mainly on the use of pencil beam aerials of high resolving power for future work, and to reserve the use of interferometric methods for special applications. A study of the available information suggests that a beam width of the order of 1° or less is desirable for such a pencil beam. For an aerial of conventional form at metre wavelengths this beam width would require a prohibitively large and costly structure so that an alternative solution has been sought. A satisfactory solution is possible because the number of randomly distributed discrete sources which can be individually detected at metre wavelengths with a large aerial is determined by the beam width (or the resolution) rather than the gain of the aerial. This follows from the fact that in these circumstances the number of discrete sources with intensities above the detectable threshold will normally greatly exceed the number which may be separately resolved. Advantage can be taken of this to construct an aerial system of high resolution but relatively low gain, that is, small effective area, which sacrifices very little of the usefulness of a conventional aerial but which can be made at a fraction of the cost. Such a system can be constructed from two long aerials arranged in the form of a cross. (a_1-4, a_2-1, b-1, c-1, d-11, e-754, f-Theory and experiment)

3382. CHASTE, R., "Etude et reglage de l'antenne du poste national a ondes longues," Ann. Radioélect, vol. 8, no. 34, pp. 301-312; October 1953. ABSTRACT: Study and regulation of long wave antenna of National Station at Allouis; antenna and feeder circuit requirements for 164 kc transmitter having 20-kc bandwidth and 500 kw output; antenna performance for broadcast transmissions. (a-3, b-1, c-3, d-3, e-0, f-0)

3383. LENG, L., "Rhombic Antennas for Transmitting Stations," Brown Boveri Rev., vol. 40, no. 10, pp. 407-16; October 1953. ABSTRACT NO. 1: Deals with the mode of operation and design of the aerials. The author explains their directional properties and, in particular, investigates the consequences of a transmitting frequency change and the possibility of rhombic aerials serving not only a single receiving point, but a specific zone. It is shown that a double rhombic aerial leads to a remarkable gain in transmitted energy compared with that offered by the single rhombic. ABSTRACT NO. 2: The radiation diagrams of a rhombic antenna is analyzed, taking account of the attenuation due to radiation. Values of maximum gain attainable with a single rhombic of characteristic impedance 600Ω are noted and the design and application of single and double rhombic antennas for point-to-point transmission and for transmission to a specific zone are considered. (a_1-2, a_2-3, b-1, c-1, d-5, e-0, f-Rhombics)

3384. YOUMANS, A.B., "Antenna Considerations for a Four Channel Crystal-Video Direction Finding System," NRL Memorandum Report No. 215, Naval Research Laboratory; 1 October 1953. ABSTRACT: The theory of operation of a four channel, crystal-video or "Wide-Open" direction finding system is outlined in relation to the establishment of the general requirements of the antenna unit for this system. A method of determining preferential radiation patterns for the antennas in terms of deflection potentials is proposed. The experimental investigation includes radiation patterns of conventional and ridge waveguide fed slots in, and dipoles near conducting cylinders and spheres. An S-band antenna system receptive to all polarizations and with suitable radiation patterns over an approximate 2:1 frequency range is being developed from this investigation. On the basis of the experimental data, this antenna unit should introduce instrumental bearing errors less than ± 7.5° in a system employing four identical channels. This order of bearing error is less than has been previously obtained over a 2:1 frequency range in four channel, crystal-video systems. (a-1, b-3, c-1, d-1, e-26?, f-Study)

3385. BOWERS, G.J., "Evaluation of Automatic Direction Finder, Lear, Incorporated, Model ADF-14," Aeronautical Electronic and Electrical Laboratory, Naval Air Development Center, Johnsville, Pennsylvania, ASTIA AD-30 683; 3 November 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

3386. ANONYMOUS, "Evaluation of the Stratford Pen Co. Small ADF Control Panel. No. 470080," USN, Naval Air Test Center, Patuxent River, Maryland, Project TED No. PTR EL-44057, ASTIA AD-24 073; 5 November 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3387. HINES, J.N., AND RUMSEY, V.H., "On the Design of Arrays," Ohio State University Research Foundation, Antenna Laboratory, Report No. 486-15, ASTIA AD-24 623; 17 November 1953. ABSTRACT: A technical report on flush-mounted antennas for direction-finding and ECM. (a-3, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3391)

3388. EGGERTON, W.H., DIEHL, W.J., ET AL., "Ground Portable Radio Direction Finder," Melpar, Inc., Alexandria, Virginia, Interim Engineering Reports, Contract AF28(099) 303; (see below) covering period May 1952 to December 1953.

Interim engineering rept. 7-31 May 52, AD-3733
Interim engineering rept. 1 June -31 Aug 52, AD-3732
Interim engineering rept. 1-30 Sept 52, AD-3820
Interim engineering rept. 1-31 Oct 52, AD-2213
Interim engineering rept. 1-30 Nov 52, AD-2211
Interim engineering rept. 1-31 Dec 52, AD-5850
Interim engineering rept. 1-31 Jan 53, AD-5849
Interim engineering rept. 1-28 Feb 53, AD-33 314
Interim engineering rept. 1-31 Mar 53, AD-41 647
Interim engineering rept. 1-30 Apr 53, AD-19 229
Interim engineering rept. 1-30 May 53, AD-17 571
Interim engineering rept. 1-30 June 53, AD-17 466
Interim engineering rept. 1-31 July 53, AD-21 772
Interim engineering rept. 1-31 Aug 53, AD-21 769
Interim engineering rept. 1-30 Sep 53, AD-33 258
Interim engineering rept. 1-31 Oct 53, AD-33 259
Interim engineering rept. 1-31 Dec 53, AD-27 073

ABSTRACT: The above list is for various engineering reports which have not been abstracted, but which are available by means of the listed ASTIA document numbers. (a-4, b-3, c-1, d-1, e-0, f-See Abstract Nos. 3156 and 3163 for abstracts pertinent to the above list)

3389. HANSEL, P.G., "Doppler-effect Omnirange," Proc. IRE, vol. 41, pp. 1750-1756; December 1953. ABSTRACT: Describes an omnirange of a new design in which the transmitting aerial is caused either to move, or to appear to move along a circular path to produce low-deviation fm by Doppler effect. The fm envelope phase of the transmitted signal is directionally characterized. Deviation-expansion and selective-degeneration in an afc circuit are used at the receiver to detect the minute directional fm in the presence of fm noise of much larger deviation. Advantages of the new omnirange include improved resolution, accuracy, and ease of multiplexing. (a-2, b-1, c-1, d-1, e-0, f-Description)

3390. HOLBROCK, J. G., "An Analysis of Errors in Long Range Radio Direction Finder Systems," Proc. IRE, vol. 41, pp. 1747-1749; December 1953. ABSTRACT NO. 1: Modern radio direction finding equipment and techniques have advanced to such a degree that it is possible to obtain accurate bearings on a signal from halfway around the globe. These successes have resulted largely from recent electrical and mechanical refinements in the modern Adcock antenna D/F system. Although the system has been described before, and applications demonstrated, to the writer's knowledge there has not been a complete investigation of its potentialities. An analysis would seem desirable because of the great utility of the system. The following material develops a rigorous mathematical analysis of the errors that are mostly encountered in the design and installation of a new direction finding station. A detailed treatment of the effect of variations in the antenna spacing is presented in support of the author's recommendations for obtaining higher efficiency in the upper frequency ranges of a given station. ABSTRACT NO. 2: Rigorous mathematical analysis of errors mostly encountered in design and installation of new direction finding station based on modern Adcock antenna system; treatment of effect of variations in antenna spacing presented in support of author's recommendations for obtaining higher efficiency in upper frequency ranges of given station. (a_1-1, a_2-3, b-1, c-1, d-1, e-0, f-Error analysis)

3391. NEXSEN, W., "An Approximate Calculation of the Fields in the Aperture of a Flared-Slot, Tapered-Depth Antenna," Ohio State University Research Foundation, Antenna Laboratory, Technical Report No. 486-16, ASTIA AD-26 872; 15 December 1953. ABSTRACT: Report on flush-mounted antennas for direction-finding and ECM. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3387)

1954

3392. BAILEY, A.D., "An Investigation of the Direction of Arrival of Radio Waves," University of Illinois, Doctor of Philosophy Thesis requirements; 1954. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-Thesis paper)

3393. FRANK, J., AND BŘÍZA, J.,"Rhombic Aerial with Feedback Coupling; Slaboproudý Obzor., vol. 15, no. 7, pp. 315-326; 1954. ABSTRACT: Power lost in the terminating resistance of a rhombic aerial is 25-50%. The efficiency of such a radiating system can be increased to 90-95% by feeding the unradiated power back to the input of the aerial. In spite of its advantages the system has not been investigated adequately and the experimental data available are few. The author derives the matching condition for the rhombic aerial+feedback-coupling line system. The voltages at the output of the feedback line and at the input to the aerial must be equal in amplitude and phase. This can be achieved by transforming the amplitude and phase of coupling line output voltage, a perfect transformation being possible at one frequency only. The measurements carried out on a model having a ratio of length of the rhomboid leg to the wavelength of 2.5 at 100 Mc/s, show that with feedback the field of the main lobe increased by 45%. Design of the transforming quadripoles is discussed and the possibility of an automatic adjustment of the transformers at changing wavelengths is considered. The paper is illustrated by numerous theoretical and experimental curves. (a-2, b-1, c-19, d-19, e-0, f-Analysis)

3394. GRINBERG, G.A., AND BONSHTEDT, B.E., "Fundamentals of the Exact Theory of Transmission Line Wave Fields," Jour. of Technical Physics, vol. 24, no. 1, pp. 67-94; 1954. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Theory)

3395. NADLER, M., "Locating Storm Centres by Radio Direction-Finding Methods," Slaboproudý Obzor, vol. 15, no. 2, pp. 56-63; 1954. ABSTRACT: Two systems used in locating the position of atmospheric disturbances are described and compared. It is thought that the French-Swiss narrowbeam direction finding recorder is superior to the British American system (main station + three instantaneous direction finders), since it (1) provides a permanent record, (2) works automatically, (3) estimates the intensity of a storm and (4) gives greater accuracy. It is suggested that the narrow-beam system can be improved by synchronizing the recording drums of the main and auxiliary stations and by transmission of the signals received by the auxiliary finders, together with appropriate time co-ordinates, to the base station. Improvement in the Bristish-American system may be achieved by transmitting the data received by the auxiliary stations, with synchronizing and calibrating pulses, to the main station. 35 references are given. (a-2, b-1, c-19, d-19, e-0, f-Sferics)

3396. SCHEGOLEV, E.V., "Marine Radio-Navigation Organization," printed in USSR; 1954. ABSTRACT: This reference has not been translated. Portions of it appear to have been copied from Keen. (a-4, b-0, c-2, d-2, e-0, f-0)

3397. EDWARDS, C.P., AND JACKSON, W.A., "Quick-Acting Crossed-Loop M.F. Direction Finders for Airborne Use," Royal Aircraft Establishment (British), Technical Note No. Radio 558, ASTIA No. AD-30 919; January 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

3398. HOPKINS, H. G., AND REYNOLDS, L.G., "An Experimental Investigation of Short-Distance Ionospheric Propagation at Low and Very Low Frequencies," Proc. IEE, vol. 101, no. 69; January 1954. ABSTRACT: The properties of the lower portion of the ionosphere have been studied at selected low and very low frequencies by observations on commercial continuous-wave transmitters located at distances of about 100 km from the receiving point. Attention has, in general been confined to the horizontally-polarized electric component of the ionospheric wave received by means of a vertical loop set normal to the plane of propagation. Using mainly twin-channel recording equipment, an outline description of which is given, the pick-up on this loop has been compared in phase and magnitude with that on another vertical loop arranged in the plane of propagation. Changes in the apparent height and conversion coefficient of the reflecting layer have been studied, mainly at 16 and 70.8 kc/s, in terms of a simple model under both normal and disturbed conditions. The data serve generally to confirm the measurements of other observers, but some discrepancies are discussed. It is considered that pulse sounding technique has advantages over the continuous-wave method for ionospheric measurements in the frequency band under review, particularly at the higher frequencies. (a-1, b-1, c-1, d-5, e-0, f-Propagation)

3399. SMITH, S.B., AND HOPKINS, H.G., "H.F. Direction Finding," Wireless Engr., vol. 31, pp. 11-14; January 1954. ABSTRACT: The causes of errors in hf direction-finding are briefly discussed and numerical estimates are made of the error-components when pulsed and continuous-wave transmissions are utilized at frequencies in the region of 8 Mc/s. Particular attention is devoted to the performance of Adcock cathode-ray direction finders in the absence of a ground ray; given adequate signal strength, pulse-operation will normally be at least as accurate as cw operation. For a well-maintained instrument of this type, installed on a good side and manned by a first-class operator, it is concluded that under the most favourable circumstances for pulse-operation (i.e., when a direct first-order echo via the E or E_s layer can be used) the expected ratio of pulse variance to cw variance is about one-third for single snap bearings; for bearings averaged over a few minutes, the expected improvement from pulse operation is rather less. These tentative estimates refer to transmission distances from about 400 to 2000 km. It is noted that ionospheric conditions do not permit the whole of this range to be covered at all times by the modes of propagation mentioned above. (a-2, b-1, c-1, d-5, e-0, f-D/F errors)

3400. VOTAW, M.J., "Dual-Channel Rotary Joint for 1250 Mc," NRL Report 4270; January 1954. See also Department of Commerce PB113092. ABSTRACT: A dual-channel rotary joint has been developed for airborne radar use. Each channel operates on the same frequency, 1250 ± 30 Mc. A two-section arrangement of chokes provides isolation between channels and electrical continuity between stationary and rotating sections of the joint. The VSWR is less than 1.09 from 1220 to 1280 Mc, the isolation between channels exceeds 85 db, and the joint meets the mechanical requirements of Specifications AN-E-19. (a-3, b-3, c-1, d-1, e-0, f-Radar equipment description)

3401. ANONYMOUS, "Proposed Military Characteristics for a Light-Weight Automatic Direction Finding Radio Compass," Army Field Forces Board No. 1, Fort Bragg, North Carolina, Late Coordination Report, 14 January 1954, ASTIA No. AD-34 869; 14 January 1954. APSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Specifications)

3402. PIETZNER, J., "Investigation of the Interference Field of Electromagnetic Waves with the Cathode-Ray Direction Finder," Fernmeldetech. Z. (FTZ) vol 7, pp. 80-84; February 1954. ABSTRACT NO. 1: The operation of a simple Adcock-type direction finder with CRT display is first described and it is shown that any particular ellipse on the screen can be produced by a wide variety of interfering fields. In order to determine unambiguously the separate bearings of two transmitters, the polar diagram of the aerial is modified to cardioid shape by the inclusion of a simple vertical aerial. The contributions of all the elements are summed in a goniometer and fed to a two-channel amplifier. ABSTRACT NO. 2: Description of a system for determing the directions of two interfering transmitters operating on the same frequency. The Adcock and vertical-antenna systems are used in conjuction with a goniometer so that the signal applied to the Y and X plates of the CRO are the signals received effectively by aerials with cardiod and figure of eight polar diagrams respectively. The two goniometer settings at which the CRO trace reduces to a straight line are ϕ_1 and $\phi_2 - \phi_1$ - 180 degrees, respectively, where ϕ_1 and ϕ_2 are the bearings for the two transmitters. (a_1-5, a_2-5, b-1, c-4, d-4, e-350, f-Description)

3403. STROM AND FANTONI, "Application of Integrator Type Signal Intensifiers," Tele-Tech, vol. 13, no. 2, p. 98; February 1954. ABSTRACT: The operational improvement of direction-finding stations using (a) Mg delay line, (b) magnetic storage drum, and (c) capacitive storage drum was studied. The bearing quality for a given range was improved considerably as a result of this post-detector integration technique. (a-3, b-1, c-1, d-1, e-0, f-Evaluation)

3404. KIRBY, R.S., "Effective Radio Ground-Conductivity Measurements in the United States," National Bureau of Standards, Circular No. 546; 26 February 1954. ABSTRACT: Maps are presented showing the results of effective ground-conductivity measurements made by various broadcasters and consulting engineers throughout the United States. The need for such detailed maps has been indicated by the lack of reliability inherent in the use of general-area conductivity maps and by studies of the correlation of effective ground-conductivity measurements with surface soil conditions. Over 7,000 radials are

shown on the maps, and provisions have been made for entering new measurements, as the results become available, for possible future publication. Due to the complexity of ground-wave propagation over an inhomogeneous earth, the determination of effective ground conductivity over a given radial strictly applies only at the frequency at which the measurements were made. (a-1, b-3, c-1, d-1, e-392, f-Conductivity experiment report)

3405. O'MEARA, T. R., "A Three-Channel Matched Radio Frequency Amplifier for Radio Direction Finding," University of Illinois, Department of Electrical Engineering Research Laboratory Report, Contract No. N6-ori-07115, ASTIA No. AD-27 640; March 1954. ABSTRACT: A three channel phase-and-gain matched radio frequency amplifier is described which incorporates a single stage of variable tuned radio frequency amplification per channel. The tuning condensers are matched, or tracked, at 51 points by means of small trimming condensers. Some of the other features are broad-band input circuits which provide nearly constant transmission line termination and also excellent phase-and-gain match over a wide range of frequencies, good overall phase-and-gain match stability, low spurious response, and provision for switching the sense channel to direction finding operation in case of failure of one of the direction finding channels. Data are presented to show the performance of various features of the unit, including curves which show the phase-and-gain alignment immediately after alignment and after "aging" of the amplifier. (a-1, b-3, c-1, d-1, e-370, f-Description. See Abstract No. 358)

3406. GRIMMETT, C.A., "Ferrite Cored Antennae," Convention Record of the Institute of Radio Engineers, vol. 2, part VII, pp. 3-7; March 1954. ABSTRACT. This paper is intended to give a brief report of the progress to date in the development of ferrite cored antennae for broadcast band use. It covers the effect on sensitivity of various design parameters such as length, diameter, winding types and core materials. It includes a brief comparison of ferrite cored and air cored antennae. Until the advent of the ferrite cored antenna, the usual built-in antenna for broadcast receivers (540-1600 kc) consisted of a large flat coil of wire usually oval in shape and mounted on one of the flat surfaces of the radio cabinet. Since the coil was air cored the factors controlling sensitivity were number of turns, coil area, and Q. These three factors were in turn limited by the minimum capacity of the tuning capacitor, the cabinet size, and the proximity of the antenna to the metal parts of the receiver. With the customers demanding smaller and more compact sets it became more and more difficult to find a place where a large area coil could be mounted far enough away from the chassis to give good sensitivity. A need was felt for a smaller more compact antenna with equivalent cost and performance to the air cored loop. It was felt that this could be met with an antenna with a ferromagnetic core. The idea of using a high permeability material for an antenna core to increase the effective area of the antenna is not new. As early as September, 1939, W. J. Polydoroff filed a patent (2,266,262) for an antenna with a core of powdered iron. In November 1940, Kihn, Harvey and O'Neill issued a report on "Loop Antennae with Ferromagnetic Cores." These early experiments all involved the use of a ferromagnetic core of finely divided iron pressed in a binder. These antennae did improve the performance of a smaller antenna, but the mass of material necessary to obtain this improvement made the cost prohibitive. A higher permeability, lower loss material was needed and was found in the ferrites. The materials now known as ferrites are a comparatively new development in the field of magnetic core materials. They are high permeability, low loss cores developed about 1946 and now manufactured by several companies in the U.S.A. The ferrites are spinal crystals of the general formula M (Fe_2 04) where M is an divalent metal or mixture of divalent metals. The most common ferrites in use today are nickel-zinc and manganese-zinc. The magnetic properties, which vary from hard to soft, of the finished product are determined by the chemical formula, completeness of crystallization, density and crystal size. The latter three are affected by the forming or pressing operation and the firing cycle. Physically, the material is very hard and brittle, similar to ceramics in properties. The theory of operation of a ferrite antenna is the same as that of any other type antenna. The object, of course, is to have the highest possible R.F. voltage induced in the antenna winding. The voltage induced then is the number of turns times the derivative of the enclosed flux with respect to time. In a tuned circuit this voltage is multiplied by the Q of the tune circuit. The main factors then which determine the effectiveness of a loop antenna are 1; the number of turns, 2; the amount of flux linked by those turns and 3; the tuned circuit Q. Anything which can increase any of these factors without decreasing either of the other two will increase the pickup of the antenna. The ferrite antenna operates mainly by increasing the flux linkages by means of the high permeability of the core. Since the material is low in losses it can be used to increase the Q of the circuit, but this is limited in practical usage as will be seen later. (a-1, b-1, c-1, d-5, e-0, f-Ferrite antenna analysis)

3407. SAMPSON, E.S., "Direction Finder Set AN/TRD-8 (XE-1)," General Electric Company, Schenectady, New York, Final Report; Contract No. DA 36-039-sc-15380, ASTIA No. AD-26 837; 4 March 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3408. SHUTTLEWOOD, G.D., "An Automatic Bearing Indicator," Royal Aircraft Establishment British), Technical Note No. RAD.563; CRB Reference No. 54/1360; ASTIA No. AD-36 220; March 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

3409. MOON, J.H., "Re-Radiation from Resonant Ship's Aerials," Marconi Rev., vol. 17, no. 113, pp. 61-63; 2nd Quarter 1954. ABSTRACT: Experiments show that it is not always necessary to isolate other aerials on board when operating the D/F. An indication is given of the distances at which various types of aerial may be used at the same time as the direction finder without impairing its accuracy. (a-5, b-1, c-1, d-5, e-812, f-Reradiation)

3410. WAIT, J.R, "Mutual Coupling of Loops Lying on the Ground," Geophysics, vol. 19; April 1954. ABSTRACT: The theory of a method to measure electrical ground constants by mutual coupling of loops is outlined. Curves are given in parametric form showing the dependence of the mutual impedance on conductivity, dielectric constants, frequency and separation. An expression is derived in the appendix for the field of a circular wire loop laid on a homogeneous conducting ground. (a-5, b-1, c-1, d-1, e-0, f-Theory)

3411. FURLOW, W.M., BENKLEY, F.G., ET AL., "Multisignal UHF Direction Finder," Melpar, Incorporated, Alexandria, Virginia, Interim engineering report nos. 14 - 29, 14 July 1952 to 30 April 1954, Contract No. AF 30(120)442, ASTIA 3819 (serial).
Reports with this title include:
Interim engineering rept. no. 14, 14 July-13 Aug 52, AD-3819
Interim engineering rept. no. 15, 1-31 Jan 53, AD-9734
Interim engineering rept. no. 16, 1-28 Feb 53, AD-11 788
Interim engineering rept. no. 17, 1-31 Mar 53, AD-11 787
Interim engineering rept. no. 18, 1-30 Aug 53, AD-15 526
Interim engineering rept. no. 19, 1-31 May 53, AD-15 525
Interim engineering rept. no. 20, 1-30 June 53, AD-17 510
Interim engineering rept. no. 21, 1-31 July 53, AD-21 771
Interim engineering rept. no. 22, 1-31 Aug 53, AD-21 770
Interim engineering rept. no. 23, 1-30 Sept 53, AD-21 768
Interim engineering rept. no. 24, 1-31 Oct 53, AD-54 491
Interim engineering rept. no. 25, 1-30 Nov 53, AD-26 586
Interim engineering rept. no. 26, 1-31 Dec 53, AD-33 122
Interim engineering rept. no. 27, 1-31 Jan 54, AD-27 785
Interim engineering rept. no. 28, 1-28 Feb 54, AD-29 216
Interim engineering rept. no. 29, 1-31 Mar 54, AD-51 021
Final engineering rept. 14 June 51-30 Apr 54, AD-44 188
ABSTRACT: Where Abstracts are available pertaining to the above listing, they will be included, according to their chronology, in this collection. (a-3, b-3, c-1, d-1, e-0, f-Project reports)

3412. ANONYMOUS, "Modification Kit for Instantaneous Direction Finder Display," Bendix Radio Division, Bendix Aviation Corporation, Baltimore, Maryland, Final Report, Contract No. AF 30(602)208, ASTIA No. AD-49 981; May 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Modification report See Abstract No. 3339)

3413. HORNER, F., "New Design of Radio Direction Finder for Locating Thunderstorms," Met. Mag., vol. 83, pp. 137-138; May 1954. ABSTRACT: Description of the main features of a twin-channel crdf instrument operating at frequencies of about 10 kc and suitable for mobile and tropical use. Its performance is similar to that of earlier designs, but simplification has been achieved by restricting the frequency range and using straight receivers. An automatic selector is incorporated for co-ordinating observations from several stations. (a-3, b-2, c-1, d-1, e-0, f-Description)

3414. WATTS, C. B., TAGGART, S. E., AND VOYLES, K. E., "Development of a VHF Directional Localizer: Part I," (Voyles, K.E., "Monitor: Part II,"). Civil Aeronautics Administration, Technical Development and Evaluation Center, Indianapolis, Indiana, Report No. CAA TDR 183. See also Department of Commerce PB132707; May 1954. ABSTRACT: This 45 page report was prepared for the Air Navigation Development Board under Project 9.1. Information pertaining to directive antennas, direction-finding and radiation patterns is contained therein. (a-4, b-3, c-1, d-1, e-0, f-Project report)

3415. KOHLER, A., "V.H.F. Direction-Finding Aerials," Funk u. Ton, vol. 8, pp. 295-302; June 1954. ABSTRACT: After a brief discussion of the most suitable methods of direction finding on vhf, three groups of directional aerial arrays for the bands 40-80, 80-160 and 160-300 Mc/s are described in detail. The aerials consist of two wideband dipoles arranged in V-shaped pairs with corresponding reflectors. They can be switched by a relay in and out of phase for determination of a signal maximum and minimum. The aerials are mounted 30° off the vertical to accept signals of both polarisation modes. An analysis of the directivity diagram and bandwidth of the array is given, and numerous polar diagrams for varying spacings of both dipoles and of dipole-reflector are reproduced and interpreted. (a-2, b-1, c-4, d-4, e-0, f-Survey and description)

3416. WARD, H. H., "Analysis of the Overstation Behavior of Aircraft ADF Systems," Aircraft Radiation Systems Laboratory, Stanford Research Institute, California, Technical Report No. 40, Contract AF 19(604)266, ASTIA No. AD-40 183; June 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Analysis)

3417. ANONYMOUS, "Filter Band Pass, F-226(XW-1)/G," Andersen Laboratories, Incorporated, West Hartford, Connecticut, Final Report, Contract No. AF 30(120)436, ASTIA No. AD-71244; 7 June 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3418. ANONYMOUS, "Direction of Arrival of Radio Waves," Electrical Engineering Research Laboratory, University of Illinois, Urbana, Illinois, Report No. DF 30, Contract No. N6-ori-7115, T. O. 15, ASTIA No. AD-37 329; 30 June 1954. ABSTRACT: Summary Statement of Progress on the Several Projects: (1) "Direction of Arrival on Waves," - E.C. Hayden, E.J. Dunn, R.S. Smith; (2) Matched-Channel Amplifier Problems," - H.D. Webb, T.R. O'Meara; (3) "Application of Probability Theory and Statistical Inference to the Radio Direction Finding Problem," - A.D. Bailey, R.L. Sydnor; (4) "Aircraft RDF and Homing Systems," - N. Yaru, D.E. Royal; (5) "Application of Ionospheric Cross-Modulation in Radio Direction Finding," - J.M. Anderson. (a-4, b-3, c-1, d-1, e-958, f-Progress report)

3419. SPRAGUE, R. M., "New Configuration of Non-Resonant Type Antenna," Andrew Alford, Consulting Engineers, Boston, Mass., Final Report, Contract No. DA-36-039 SC-42569, ASTIA No. AD-49369; 30 June 1954. ABSTRACT: The purpose of the work under this contract is to determine the advantages of several configurations of rhombic antennas suggested by the Coles Signal Laboratory, and to inquire into other possible configurations. Standard rhombic antennas are usually constructed with all four sides in the same plane. The apex angle is determined from the wire lengths, on the basis of a compromise between (a) the direction of the major lobes of each of the four wires, on one hand, and (b) the phase of the radiations from the back pair as compared with the phase of the front pair on the other hand. In some installations, the apex angle is chosen to be optimum for the direction of the major lobes, while optimum phase is obtained by inserting the proper phase delay at the two corners of the rhombic. Under such conditions a slightly higher gain is obtained at the design frequency, and improved operation results over a fairly narrow band. In other installations two or even three wires are used per leg, with the wires diverging from zero separation at the front and back apexes to a separation of say 10 feet at the corners. The purpose of such a configuration is an attempt to maintain the characteristic impedance of the antenna constant along its length, thereby minimizing undesired reflections. The wire separation however, is normally small compared to the other dimensions of the antenna, so that the four legs of the rhombic are essentially in the same plane insofar as the effect on the radiation pattern is concerned. It was suggested that a greater separation of the two wires in each leg might have a beneficial effect, not only on the input impedance and radiation resistance, but also on the antenna patterns. The present report deals with these configurations. This final report deals first with the antenna configurations discussed in the first semi-annual report. The results therein described are reviewed, and patterns of several configurations were rerecorded. A further study of undesired vertically polarized radiation has now been completed, and a direct comparison of vertically and horizontally polarized radiation is made. This comparison is available for the 3.2 leg wavelength rhombic over a two to one frequency band, for both the azimuth and vertical cuts of the radiated field. This report also reviews the antenna configurations discussed in the second semi-annual report. Those configurations consisted essentially of a two pole inclined rhombic with the feed and load apexes at ground level and side apexes elevated. A similar configuration, using using only one pole for support is discussed in this report. The antenna consists essentially of two inclined vees, placed apex to apex, with the bisector of each vee in the same vertical plane. Their apexes are supported a distance above ground on a single pole, with their open ends terminated near ground level. The separated ends of one of the vees, say the nearest, are fed in phase opposition by means of suitable nonradiating transmission lines in conjunction with baluns. The separated ends of the farthest vee arc terminated in two power dissipating elements. The configuration discussed in the first half of this report shows no striking improvement over older types of antennas. On the other hand, the configuration discussed in the latter part of this report shows promise of being a step forward in the development of communication antennas. We believe this antenna should be given serious consideration and should be studied further in detail on lower frequency models. (a-1, b-3, c-1, d-1, e-881, f-Analysis)

3420. BOLLJAHN, J. T., "Antennas for Airborne ADF Systems," Stanford Research Institute, Stanford, California. See Department of Commerce PB134579, ASTIA No. AD-42253; July 1954. ABSTRACT: This report presents the results of a study of the antenna requirements of the AN/ARN-6 Automatic Direction Finder (ADF) system and of antenna types of antenna design techniques that may be used with this system. Basic information on antenna requirements has been gathered by measuring the receiver sensitivity as a function of sense-antenna sensitivity, both for ADF operation and for station identification. Contract AF 33(616)-83, Final report. SRI Proj. 606, Task II. (a-3, b-3, c-1, d-1, e-0, f-Study report)

3421. CARTER, P. S., "Feasibility Study of H-F Airborne Direction Finding," Stanford Research Institute, Stanford, California, Interim engineering report no. 1 - SRI Project 606, Task IV, Contract No. AF 33(616)-83, ASTIA No. AD-57 084; July 1954. ABSTRACT: This report presents considerations of the feasibility of radio direction finding from aircraft, in the hf frequency band (2-24 Mc). The antenna proposed for this application is a wing-mounted H-Adcock. Model radiation patterns of this antenna mounted on a 1/43-scale C-54 aircraft were measured, and on the basis of these patterns the operating frequency range for accurate direction finding on the full-scale C-54 is shown to be restricted to a band from 2 Mc to about 12 Mc. The elements of a full-scale Adcock mounted on a mockup section of the C-54 wing were equalized to obtain satisfactory antenna patterns. The system sensitivity of a direction finder employing the proposed antenna was calculated, and the effect of various factors such as atmospheric noise and ionosphere fluctuations was analyzed. The upper operating frequency of the airborne direction finder being limited, the distance range of the direction finder is correspondingly restricted. These range limitations were studied using standard propagation data. On the basis of the feasibility studies, basic D/F designs are proposed. The problems involved in the construction of the system are illustrated and discussed. (a-1, b-3, c-1, d-1, e-882, f-Study report)

3422. SAXTON, J. A., "Basic Ground-Wave Propagation Characteristics in the Frequency Band 50-800 Mc/s," Proc. IEE, Part III, vol. 101, pp. 211-214; July 1954. ABSTRACT: The relation between existing experimental data on transmission at vhf, at distances such that variations in atmospheric refractive index are of little significance, and fundamental propagation theory are discussed. An empirical correction for the difference between the field strengths observed over irregular terrain and theoretical values is given, and basic ground-wave characteristics for the frequency band 50-800 Mc/s are suggested which should be applicable except in very mountainous country or in densely built-up areas. Over this frequency band, and for distances inside the normal horizon, it appears that there is very little variation of median field strength with frequency for a given effective radiated power. (a-1, b-1, c-1, d-5, e-0, f-Propagation study)

3423. ZIEHM, G., "Derivation of a Practical Approximation Formula for the Inherent Error in a 6-Mast Adcock Array," Telefunken Ztg., vol. 27, pp. 97-103; July 1954. ABSTRACT: The "inherent" error is the error due to the finite number of antennas in the array. For angles of incidence $0 < a_E < 30$ degrees, the maximum error occurs at $a_E = 15$ degrees and is given approximately by 60 degrees. $J_8(K)/J_1(K)$ when $J_8(K)/J_1(K) \leq 0.2$, where $K = b\pi/\lambda$ and b = distance between opposite masts. A graph shows the maximum error for b = 12 m and b = 8 m, at frequencies between 10 and 25 mc. With a 12-m base, but not with an 8-m base, calculation shows that sense determination becomes impossible at a frequency of about 19 mc; this was verified experimentally. (a-5, b-1, c-4, d-4, e-0, f-D/F error)

3424. ANONYMOUS, "Rawin Set AN/GMD-1A," U.S. Department of the Army, Technical Manual 11-271A, USAF Technical Order No. T016-30 GMD1-5; August 1954. ABSTRACT: Rawin Set AN/GMD-1A is a transportable radio direction finder. It is designed to track a balloon-borne radiosonde transmitter automatically. The rawin set, a meteorological recorder, and a radiosonde transmitter constitute a

rawinsonde system. The rawinsonde system is used to make atmospheric soundings. This is accomplished by measuring wind speed, wind direction, pressure, temperature, and humidity throughout the vertical extent of the sounding. These measurements are used for the analysis and forecasting of weather conditions, the guidance and planning of the navigation of aircraft, and the preparation of ballistic corrections for the effect of the atmosphere on the trajectory of projectiles, missiles, and rockets. (a-1, b-3, c-1, d-1, e-0, f-Instruction manual)

3425. BANOS, A., AND WESLEY, J. P., "The Horizontal Electric Dipole in a Conducting Half-Space," Part II, University of California, Marine Physical Laboratory of the Scripps Institution of Oceanography and Institute of Geophysics, Sponsored by Bureau of Ships, Contract NObsr-43356, NE-120021; August 1954. ABSTRACT: This report, Part II, constitutes the culmination of a research study which was described initially in a paper of the same title, Part I, and provides a further account of the mathematical theory involved in the determination of the electromagnetic field components generated by a horizontal electric dipole embedded in a conducting half-space. In particular, a detailed account is given of the computations involved for points of observation in the non-conducting medium when the depth of the source and the height of the point of observation are small in comparison with the horizontal range. The first part of this report is concerned mainly with the general evaluation of the fundamental integrals for both media by the double saddle point method of integration developed earlier, and the salient feature of the present analysis is the fact that the new asymptotic expansions are term-wide differentiable to any order with respect to three essential parameters: horizontal range, depth (or height) of dipole source, and height (or depth) of the point of observation. The remainder of the report is concerned with the application of the new asymptotic expansions to the evaluation of the Cartesian components of the Hertzian vector and of the cylindrical components of the electromagnetic field vectors for points of observation in the non-conducting medium. Simplified approximations in which numerical substitutions can be readily made are presented for three distinct ranges corresponding to the asymptotic, the intermediate, and the near field; and, in each case, a detailed account is given of the power flow in the field. In addition, there is presented for points of observation in the non-conducting medium, an approximation valid down to zero horizontal range. Numerical results are given in a manner similar to the numerical example presented in Part I. (a-1, b-3, c-1, d-1, e-281, f-Lengthy analysis. See also Part I, Abstract No. 3376)

3426. BREMMER, H., "The Extension of Sommerfield's Formula for the Propagation of Radio Waves over a Flat Earth, to Different Conductivities of the Soil," Physica, vol. 20, pp. 441-460; August 1954. ABSTRACT: The influence of non-homogeneous soil conditions on the propagation of radio waves over a flat earth can be investigated with the aid of an integral equation based on Green's theorem. This equation applies to all types of distributions (also continuous) of the conductivity and of the permittivity of the earth; it is essentially identical with the integral equation considered by Hufford for the propagation over irregular terrain. The special solution for two adjacent regions of homogeneous electrical constants can be treated numerically with the aid of two different expansions for the field near the separating boundary and for the field far beyond this boundary; the rigorous solution of the integral equation proves to be identical with the corresponding expression derived in a very different way by Clemmow. The solution for three adjacent homogeneous regions can be obtained by solving the general integral equation by a similar method. (a-1, b-1, c-12, d-12, e-0, f-Theory)

3427. MILLINGTON, G., "Ray-Path Characteristics in the Ionosphere," Proc. IEE, Part B, vol. 101, pp. 193-197; August 1954. ABSTRACT: This paper is essentially a simplification and extension of an earlier paper by the author, which dealt with the ray treatment of wave propagation in a horizontally stratified ionosphere above a plane earth in the presence of a magnetic field that is constant in strength and direction. A further study of the problem has shown that, by the use of a new parameter, the analysis in Reference 1 can be improved. Some of the well-known results of magneto-ionic theory receive a specially simple explanation. The remarkable phenomenon described by Poeverlein for propagation in the magnetic meridian plane follows as a natural outcome of the argument, while the direction-finding problem of Alpert and Elghozi can be embraced in a limit theorem in which calculations are freed from small differences. The modification produced by the magnetic field in the amount of non-deviative absorption also takes a form that is convenient for computation. (a-1, b-1, c-1, d-5, e-522, f-Propagation)

3428. VOTAW, M. J., "Dual-Channel Rotary Joint for 3300 Mc," NRL Report R-4398; August 1954. See also Department of Commerce PB115441. ABSTRACT: A dual-channel rotary joint with 7/8-in. coaxial line fittings has been developed for an airborne S-band antenna. A Teflon-filled coaxial line is carried inside the inner conductor of an air-filled line. Mechanical arrangement of the joint is designed to fit a particular antenna pedestal and to withstand the vibration and corrosion specifications of AN-E-19. (a-3, b-3, c-1, d-1, e-0, f-Description)

3429. YERG, D. G., "Study of Ionospheric Winds; Scientific Report No. 2," Univ. of Puerto Rico, College of Agriculture & Mech. Arts, ASTIA No. AD-55633; August 1954. ABSTRACT: A simplified correlation method has been developed for the evaluation of ionospheric winds from radio fading records. The method involves only six values of the correlation coefficient and is shown to be approximately equivalent to the longer procedure requiring graphs of the auto-correlation and cross-correlation functions. The method also allows for the assumption of an ellipse for the correlation contours in the horizontal planes. The drift velocity, fading velocity, and characteristic velocity are evaluated for this theory extended to include elliptical contours. The physical origins and implications of the derived velocities are studied. It is shown that the application of the correlation method requires that the interference pattern be unchanging and drifting in the direction of the wind with twice the speed of the wind. The correlation ellipse is representative of the shape and orientation of the interference pattern only if the random fluctuations are independent of direction. Preliminary data suggest that the random fluctuations are associated with a possible geomagnetic or geographic control and are not isotropic. Data also indicate that it is not possible to determine the validity of the method of similar fades by visual inspection of the records. Turbulence was an important factor in all the fading records obtained. (a-1, b-3, c-1, d-1, e-883, f-Propagation study)

3430. SKAPERDAS, D., "UHF Radio Direction Finder Antenna," Balco Research Laboratories, Newark, New Jersey, Monthly Report No. 1, Contract AF 30(602)1186, ASTIA No. AD-55 242; 20 August 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report)

3431. CLARK, C. T., ET AL., "Navaglobe-Navarho Long-Range Radio Navigational System," Elec. Commun., vol. 31, pp. 155-166; September 1954. See Convention Record IRE, vol. 2, part 5, pp. 88-97; 1954. ABSTRACT NO. 1: The navaglobe system developed for the U.S.A.F. is described; reliability is achieved by operating at a frequency of about 100 kc, and tolerable signal/noise ratio at long range by using a bandwidth of 20-100 cps. The service is omnidirectional and the airborne bearing indications are automatic. Arrangements for reducing the effects of atmospheric noise are described. Performance on transcontinental and transatlantic tests is reported. Plans to complete the system by incorporating phase-comparison distance-measurement equipment are discussed. ABSTRACT NO. 2: Long-range air navigation to date has been done by dead reckoning. This involves complicated calculations and measurements by trained navigators. Navaglobe is being developed to give a continuous bearing of the aircraft from a fixed point and Navarho to give both range and bearing. Examination showed that if reliable day-in and day-out range of transmission was 1500 nautical miles, sufficient and suitable land sites could be found to cover all polar and oceanic regions with a position-fixing service. Navaglobe uses 3 aerials situated at the corners of an equilateral triangle and spaced 0.4 λ apart, i.e., 3600 ft when transmitting on 100 kc/s. R.F. power is supplied to aerials 1-2, 2-3, and 3-1 in sequence at a frequency of one per sec. The radiation pattern for each pair is a figure eight, thus there are three such 8's at 120° to each other. Therefore, in any given direction three strengths of signal will be received in sequence. After rectification the 3 dc signals are applied to three deflector systems mutually at 120° to each other on a common shaft carrying a bearing indicator. The deflection is governed by the torques exerted by the relative values of the signals and hence the indicator shows the bearing of the ground station from the aircraft. In test flights the system gave satisfactory results up to 2000 miles by day and night. Photos of the navigator's instruments are given and a description of the method of overcoming interference by using very narrow bandwidths. (a_1-5, a_2-5, b-1, c-1, d-1, e-0, f-Survey)

3432. EVERDEN, W. A., "Ferrite Rod Aerials," Wireless World, vol. 60, no. 9, pp. 440-444; September 1954. ABSTRACT: With the introduction of the nickel-zinc grades of Ferroxcube with their high material permeabilities and low losses many new fields of application have been opened up. Not the least important of these is the replacement of bulky frame aerials by relatively small rods and coils. All aerial rod designs in this article are based on Ferroxcube rods in grade B2, which has an initial premeability of approximately 200

and a resistivity of 10^5 ohm-cm. Its loss factor $\tan\delta/\mu$ at 0.5 Mc/s being 90×10^{-6}. It should not be assumed that rod aerials, as they have come to be known, can only replace frames or indoor systems; with a rod of larger proportions than those discussed in this article, a signal voltage comparable with that of an outdoor aerial in combination with a normal input circuit can be approached. Interference which is now so prevalent all over the long and medium wavebands can often be reduced by the directional effect inherent in these assemblies. Although the advantages of such a system are immediately evident, the design of a suitable assembly is rather complex, due mainly to the lack of practical design data on open-ended coils. An attempt will be made in this article to combine all necessary data on this form of aerial into workable formulae, and to present examples of the manner in which ferrites can be used in practical aerial systems. Before analysing the physical properties of rod aerials it may be worth while to discuss the relative merits of inductive and capacitive aerials, as the basis of comparison may not be immediately obvious. The efficiency of any type of aerial is usually judged from the voltage delivered to the grid of the first valve. With an average domestic aerial of dimensions under a half wavelength, used in conjunction with a matching transformer, the voltage is proportional to the product of the field intensity (vectorially) in volts per metre, the effective height (h) in metres and the transformer ratio (N). With inductive aerials, including rod aerials, the voltage at the first grid is mainly determined by the product of the effective height (h) and the aerial circuit quality factor (Q). No direct comparison should be made between these two types of aerial. However, a comparison can be made between the products of effective height (h) and transformer ratio (N) of the capacitive aerial against the effective height and quality factor Q of the latter. Frame Aerials - At the input to any aerial the field concentration and frequency of the transmitter signal are usually known. A loop of n turns enclosing a part of the radiated field will then have induced in it an emf of

$$e_1 = \Phi\omega n \cdot 10^{-8}$$

$$= Ba\omega n \cdot 10^{-8} \text{ volts}$$

where the cross-sectional area of the loop is a sq. cm., the flux Φ = Ba and the flux density B is in gauss. If Q is the input circuit quality factor, then the voltage becomes e_1Q, denoted e_0, and is applied to the grid of the first value. Therefore

$$e_0 = QBa\omega n \cdot 10^{-8} \text{ volts}$$

Rod Aerials - The main purpose of a high-permeability ferromagnetic core is to increase the flux density B within the closed loop. For satisfactory operation this should take the form of a rod so that the flux may be concentrated within the turns of the coil. By redesigning the aerial coil and inserting a ferromagnetic core, the effective permeability of the enclosed medium to an external field is increased. This effective permeability μ' is much lower and should not be confused with the initial permeability μ_0 of the core material as measured in a closed magnetic circuit. The output voltage now becomes:

$$e_0 = \mu' QBa\omega n \cdot 10^{-8} \text{ volts}$$

The calculations of μ' will not be dealt with here, as it is fully covered in the literature; it is only necessary to say that μ' can never exceed μ_0, and depends mainly upon the physical dimensions of the core. It has often been argued that a flat plate of ferromagnetic material would be more suitable for this application than a small-diameter rod, but experiments leading to the computing of Fig. 5 have shown that the flux density inside a plate at right angles to the magnetising field differs very little from that of the magnetising field. This can be shown if we take a plate of Ferroxcube with an initial permeability of 200 and dimensions ℓ = 114 mm, d = 6.3 mm. The ℓ/d ratio then becomes 0.055 and from Fig. 5 we obtain an effective permeability μ', which is for practical purposes unity. With the introduction of a ferromagnetic core, the aerial system becomes considerably modified. So far we have been considering it primarily in relation to the external field, but it is also part of a tuned circuit and must have a specific value of inductance L. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

3433. TROOST, A., "Problems of Direction-Finding on Ships at Frequencies in the Intermediate Band (1.5-3.5 Mc/s)," Telefunken Ztg., vol. 27, pp. 149-155; September 1954. ABSTRACT NO. 1: Resonant structures aboard ship are sources of considerable error at these frequencies. The effects are considered in some detail. Mounting a small crossed-loop antenna as high as possible on the ship reduces errors considerably, but errors can be suppressed if the sources are located by measurements while the ship is in harbor. ABSTRACT NO. 2: Discusses such difficulties as blank spots caused by obstructions such as masts and funnels, side lobes in the aerial polar diagram, and general calibration problems. Results of experiments on the steamship "Langeoog" are given to illustrate these difficulties. (a_1-5, a_2-5, b-1, c-4, d-4, e-415, f-Evaluation)

3434. GLEASON, R. H., AND SNYDER, K. G., "Performance of a Model AN/SRD-7 Small Spinning Loop Medium Frequency High Frequency Direction Finder for Shipboard Use," Naval Research Laboratory, Naval Research Laboratory Memorandum No. 363; 1 September 1954. ABSTRACT: Detailed performance tests on AN/SRD-7 direction-finding equipment. (a-4, b-3, c-1, d-1, e-114, f-Test report)

3435. LEVIS, C., "Note on Receiving Antenna Sensitivity," The Ohio State University Research Foundation, Columbus, Ohio. Contract No. AF 18(600)85, ASTIA No. AD-56559; 30 September 1954. ABSTRACT: The power delivered by a receiving antenna at a pair of terminals is expressed directly in terms of relative field patterns, antenna mismatch, and efficiency. For resistive loads, a simple chart shows directly the effects of mismatch and efficiency. (a-1, b-3, c-1, d-1, e-885, f-Theory)

3436. BAIN, W. C., "On the Rapidity of Fluctuations in Continuous-Wave Radio Bearings at High Frequencies," Proc. IEE, paper 1715 R, publ. October 1954. ABSTRACT: Bearing observations were made with an Adcock direction-finder on distant hf transmitters at a rate of 5/sec. The auto-correlation function of the observations was calculated; the analytical formula found most useful as its representation was $\epsilon^{-\tau/\tau_0}$, where the mean value of τ_0 was 0.75 sec with a standard deviation of 0.51 sec. Expressions are given for the reduction in the variance of bearing error to be obtained by time-averaging. (a-2, b-1, c-1, d-5, e-0, f-Analysis)

3437. WAIT, J. R., AND POPE, W. A., "Evaluation of Errors in an Eight-Element Adcock Antenna," Trans. IRE, vol. AP-3, no. 4, pp. 159-162; October 1954. ABSTRACT: An analysis is given for the response of a 8-element direction-finding aerial to a localized R.F. source. The error between the indicated and true bearing is evaluated and illustrated by graphs. It is also shown that the additional error, introduced by bringing the source into proximity of the aerial system is negligible if the aerial source distance is > 5 λ. This is important in calibrating the system. (a-2, b-1, c-1, d-1, e-0, f-Analysis)

3438. ANONYMOUS, "Interim Engineering Report on Short Range D/F Plotting Equipment," Bendix Aviation Corporation, York Division, York, Pennsylvania, Report Nos. 4108-02 and 4108-03, ASTIA Index Nos. AD-48134 and AD-48133; 1 September and 1 October 1954. ABSTRACT: (1) The York Division, Bendix Aviation Corporation, under the terms of Contract AF 30(602)-1172 will design and construct one engineering model of Short Range D/F Plotting Equipment for Rome Air Development Center, Griffiss Air Force Base, Rome, New York. Overall nomenclature for the Short Range D/F Plotting Equipment has been applied for by Rome Air Development Center, but has not yet been received. The contractual delivery date for the engineering model D/F Plotting Equipment is 1 March 1955. (2) The Short Range D/F Plotting Equipment will utilize manually and automatically entered direction finding bearings from as many as four separate D/F stations. These bearings will be displayed sequentially on a cathode-ray tube. The cathode-ray tube has a one-to-one area corresponding to a superimposed map, so as to form a visually instantaneous D/F triangulation and enable the operator to determine the location of radio transmissions. (3) The unit will receive its information from as many as four Direction Finder Control Unit C568/GRD. Each D/F station requires one of these controls. Bendix will endeavor to mount a switch subassembly associated with the control units on the D/F Plotting Equipment control panel. It was agreed that the extent of this work will be entirely at the discretion of Bendix, and no revision of the contract will be made. (a-1, b-3, c-1, d-1, e-884, f-Progress reports)

3439. ANONYMOUS, "Radio Compass for Airlines," Elect. J., vol. 153, p. 1043; 1 October 1954. ABSTRACT: Description of the automatic direction finder Type AD7092C, which includes tunable sense amplifiers to overcome intermodulation problems encountered in areas with numbers of broadcasting stations close together. Bearing accuracy is within ±2 degrees. The weight of the equipment is 15.3 pounds. (a-5, b-2, c-1, d-5, e-0, f-Description)

3440. ANONYMOUS, "Manuscript Form Instruction Manual for Direction Finding Set AN/SRD-7," Stewart Warner Electric Company, Chicago, Illinois, Contract Nos. 52218 and 63065, NavShips 92349; 4 October 1954. ABSTRACT: A massive, detailed instruction and maintenance manual on the above named equipment. (a-4, b-3, c-1, d-1, e-556, f-Instruction manual)

3441. ANONYMOUS, "Flight Test and Evaluation of UHF Homing Adapter, AN/ARA-37," Naval Air Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-45 865; 20 October 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

3442. ANONYMOUS, "The Engineering Study & Investigation Leading to the Design and Construction of a VHF-UHF Directional Antenna," Pickard & Burns, Inc., Needham, Mass., First Quarterly Report, Contract No. AF 30(602)-1242, ASTIA No. AD-51934; 22 October 1954. ABSTRACT: An analytical and experimental study leading to the design and construction of a UHF-VHF Directional Antenna has been started. The main emphasis has been placed on determining the parameters that would yield the smallest and simplest configuration for the antenna design. Calculations have been made which indicate that compliance with the specifications would be obtained with a minimum of 48 equally spaced elements around the circumference, with a group of 17 adjacent elements being fed. Experiments were conducted with various radiating elements. The element chosen as having the most suitable properties was a slot antenna cut out of copper screening. A full scale model was constructed for Band III, the experimental patterns of which showed excellent agreement with the calculations. The impedance characteristics were satisfactory over the entire band and no impedance matching elements were required. (a-1, b-3, c-1, d-1, e-887, f-Study)

3443. JAFFE, H. M., "The Development of Direction Finder Set AN/TRD-4," Signal Corps Engineering Laboratories, Monmouth, Engineering Report No. 1149;29 October 1954, ASTIA Index No. AD-63712. See also ASTIA AD-66811. ABSTRACT: Radio Sets SCR-291 and SCR-502 hf radio direction finders using crossed-Adcock antenna systems and motor-driven inductive goniometers to provide automatic visual bearing presentation on cathode ray tube indicators, were developed for the Signal Corps during World War II. These sets were used extensively and their electrical performance was generally satisfactory. However, they were somewhat too large and difficult to erect and transport to be conveniently used in tactical applications. Furthermore, they presented considerable maintenance problems because certain of their components were critical with respect to electrical and mechanical tolerances. Radio Set AN/CRD-2, developed at the end of World War II as a replacement for the SCR-291 and SCR-502, employed an all electronic goniometer and bearing indicator, eliminating the mechanical maintenance problems of the replaced sets. Also, it was packaged to be somewhat more suitable for tactical employment. However, reports received from field units using the AN/CRD-2 indicate that the complex circuitry included in its electronic goniometer and bearing indicator present new types of maintenance and operating problems which are more severe than the problems previously encountered with Radio Sets SCR-291 and SCR-502. Therefore, work was initiated to develop a new direction finder having characteristics superior to that of its predecessors. This work led to the development of Radio Set AN/TRD-4. This report describes the development of, and indicates the results obtained in testing an experimental model of Radio Set AN/TRD-4. The report also describes the final production version of this set which is now being produced by the Servo Corp. of America under Contract Nr. DA36-039 sc-5606. Direction Finder Set AN/TRD-4, an equipment operating in the hf band, has been developed to replace Radio Sets SCR-291, SCR-502 and AN/CRD-2, the direction finders previously used by the Army in tactical radio intelligence operations. This equipment is superior to the preceding sets for this application in several ways. First, it provides greater operating flexibility in that it includes facilities to permit either short range, mobile operation with a loop antenna or longer range transportable operation with an Adcock antenna. Second, it has been especially designed, from a mechanical and packaging standpoint, for use with a rapidly moving field army; it is completely contained in a lightweight shelter capable of transportation on standard general purpose, cargo type vehicles; the shelter is well lighted, heated and ventilated and provides convenient and comfortable quarters for the operating personnel; the antenna systems are designed to permit quick erection and disassembly; the set contains all auxiliary equipment, including a power source, required for direction finding operation. Third, the AN/TRD-4 has been designed to eliminate much of the complex circuitry used in equipments of the SCR-291 and AN/CRD-2 types; this should result in a considerable decrease in the operating and maintenance problems associated with prior type sets. All of these advantages have been achieved in a set whose performance is at least as good as any direction finder previously developed. (a-1, b-3, c-1, d-1, e-888, f-Summary report)

3444. HABER, F., "Generation of Standard Fields in Shielded Enclosures," Proc. IRE, vol. 42, no. 11, pp. 1693-1698; November 1954. ABSTRACT NO. 1: This paper described in detail calculations which are necessary in order to obtain accurate measurements on the equivalent field produced in a screen room using the instrumentation line method. Under most practical conditions these results will reduce to those presented by Bond. ABSTRACT NO. 2: Method for calibrating loop antennas; scheme involves generation of known field in vicinity of loop by energized wire mounted near ceiling of enclosure; new formulas with which field can be predicted with better than 1% accuracy in low and medium frequency ranges for most installations. (a_1-4, a_2-3, b-1, c-1, d-1, e-0, f-Detailed description)

3445. HORNER, F., "The Accuracy of the Location of Sources of Atmospherics by Radio Direction-Finding," Proc. IEE, Part III, vol. 101, pp. 383-390; November 1954. ABSTRACT NO. 1: An investigation of the accuracy of the United Kingdom network of twin-channel cathode-ray direction finders operating at frequencies near 10 kc is reported. Hilly terrain and buried cables have caused errors of several degrees at some stations. Instrumental errors are small, apart from polarization errors, which may be as high as 2 degrees or 3 degrees in summer daytime and rather higher in winter. An estimate has been made of the accuracy of storm location; the potential accuracy depends not only on bearing errors, station spacing, and storm distance, but also on the number and interpretation of the observations. With the existing network and technique, the probable error in position of a storm center distant 1,000 km is about 20 km on a summer day, 50 km on a winter day, and 100 km by night. ABSTRACT NO. 2: The accuracy is estimated mainly from results obtained from 4 twin-channel cathode-ray direction-finders operating at about 12 kc/s. The probable error in locating the storm centre at 1000 km was about 20 km during summer day-time; 50 km during winter day-time; and 100 km at night. The errors consisted of instrumental and observational errors; errors due to interference by atmospherics other than that under observation; site errors and errors due to buried cables; and polarization errors. The standard deviation due to instrumental errors was < 1°, and that due to observational errors could be reduced to 0.5°. Errors due to interference between atmospherics could be a major source of error beyond 1500 km, and depended on amplitude, rate of arrival and rate of decay of the resultant impulses set up in the amplifier. A formula expressing the standard deviation due to this erroris given. The site errors were mainly due to sloping ground, and the preferred site is specified. Maximum polarization occurred between 250-600 km, and in summer day-time reached 3°, and rather more in winter day-time. At night still greater errors may be expected, but the degree is uncertain since the estimates were based partly on observations on fixed cw transmitters which are believed to produce greater errors than atmospherics. (a_1-6, a_2-5, b-1, c-1, d-5, e-472, f-Study, spherics)

3446. ANONYMOUS, "Direction Finder, Automatic Light Weight, Airborne; Second Quarterly Progress Report, Quarter Ending 31 October 1954," The Magnavox Company, Engineering Department, DA Project No. 3-25-05-051, SC Project No. 965A; 18 November 1954. ABSTRACT: Interim project status report concerning the development of equipment similar to AN/ARN-6 in function. (a-4, b-3, c-1, d-1, e-886, f-Report)

3447. NICOLET, M., "Meteor Ionization and the Night-time E Layer," The Pennsylvania State University, State College, Pa., Scientific Report No. 72, Contract No. AF 19(122)-44, ASTIA No. AD-55982; 30 November 1954. ABSTRACT: The nighttime E-layer has been studied by examining data obtained by classical ionospheric recorders, in order to consider the possibility of an ionisation effect due to meteor atoms. The presence of ionization of the order of 10^4 electrons cm^{-3} maintained throughout the night demonstrates that the laws of daytime E-layer recombination are not applicable at night. In fact, a very low value for the recombination coefficient must be adopted, consistent with radiative recombination, as used for observed meteor echo durations. Furthermore, the process of electron attachment must be counterbalanced by collisional detachment restricting the negative ion-electron ratio to a value not much larger than unity at 100 km. Consideration of the various processes which may affect meteor atoms introduced in the atmosphere indicates that times of the order of one or more months must elapse before an appreciable number of the meteor atoms introduced are involved in the specified processes. Consequently, atmospheric motions are important in redistributing meteor atoms in the atmosphere. In particular, diffusive transport appears to lead to an accumulation of meteor atoms near 100 km. This evidence indicates the nature of the problem; however, it is approximate since no information is given of the importance of mixing which permits the use of a vertical distribution following the atmospheric distribution above the concentration peak, depending on the molecular formations. Several suggestions are made for future study of the problem so that more detailed knowledge of the behavior of meteor atoms can be formulated. (a-1, b-3, c-1, d-1, e-889, f-Study)

3448. COAKLEY, J. D., FUCIGNA, J. T., AND BISHOP, E. W., "A Human Engineering Review of the Direction Finder Set AN/GRD-9," Dunlap and Associates, Incorporated, Stanford, Connecticut, Report No. RADC-TN-55-105, Contract No. AF 30(602)215, ASTIA No. AD-57 173; December 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3449. GARNER, W. E., AND DINGER, H. E., "The Shielded Transmission Line Method of Generating Standard Fields," USN, NRL Report No. R-4451. See also Department of Commerce PB116500; December 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3450. ITO, Y., AND TANAKA, I., "Development of the Ring Goniometer for Radio Direction Finders," Trans. IRE. vol. ANE-1, no. 4, pp. 20-24; December 1954. ABSTRACT: The ring goniometer consists of two coils wound on ring-shaped concentric iron cores. The outer acts as a field and the inner as a search coil. The system is efficient because (a) the coupling coefficient is high, (b) the coupling error is very small and readily eliminated and (c) the system is of simple construction and its performance is easily analysed mathematically. (a-2, b-1, c-1, d-1, e-428, f-Goniometer design data,

3451. ROCKE, A. F. L., "On the Location of Reradiators," Unpublished Report; December 1954. ABSTRACT: Measurements of bearing errors are made at two or more fixed transmitter positions and at close frequency intervals over an appropriate range. Varying the frequency will make the bearing error vary between positive and negative limits. The frequencies at which the errors are extreme are those at which the direct and re-radiated waves are either in phase or in opposition. (Reference is made to these extremes rather than to zeros because the latter are more influenced by other forms of error such as pointer shift, etc.) Assuming that the phase change on re-radiation is independent of frequency over the range used in the experiment, the position of the re-radiator can be found in the following manner. (Neglecting phase-change places a limit to the accuracy of plus or minus half of the working wavelength, but this limit is seldom approached.) (a-1, b-0, c-1, d-0, e-363, f-Reradiation analysis)

3452. WEAVER, H. K., "Study of Receiving-Antenna Coupler CU-308/U," Stanford Research Institute, Final Report, Contract No. AF 33(616)-2538, ASTIA No. AD-58417; December 1954. ABSTRACT: The Loran-Liaison Receiving Antenna Coupler CU-308/U is intended to provide, from a single airborne receiving antenna, independent outputs for one Loran Receiver AN/APN-70 and two liaison receivers AN/ARC-21 or its equivalent. Operational experience with receiving systems employing the CU-308/U have demonstrated that the coupler performs satisfactorily except for the high level of distortion products generated in the hf liaison sections by strong input signals. The purpose of this study is to find a modification of this coupler which reduces distortion to an acceptable level without materially sacrificing other characteristics. One modification using negative feedback in the hf circuits of the coupler reduces distortion products by more than 20 db and increases receiving system noise figure by a little over 3 db. This modification results in some simplification of the present coupler. Another modification substitutes an all passive circuit for the hf portion of the CU-308/U. Distortion is eliminated by eliminating the vacuum tubes. The study on noise figure shows that the passive circuit results in improved sensitivity as well. (a-1, b-3, c-1, d-1, e-890, f-Study)

3453. KALMUS, P., "Direction-Sensitive Doppler Device," Diamond Ordnance Fuze Laboratories, Washington, D. C., DOFL Report No. TR-135, Contract No., ASTIA No. AD-216 908; 6 December 1954. ABSTRACT: A simple double-doppler device is described which makes it possible to determine the direction of motion in addition to measuring velocity. The same principle can be employed to measure distances, temperature or small frequency differences. In addition an application of the device for moving target indication is described. (a-1, b-3, c-1, d-1, e-0, f-Description)

3454. PARKINSON, R. W., "The Nighttime Lower Ionosphere as Deduced from a Theoretical and Experimental Investigation of Coupling Phenomena at 150 KC/SEC," The Pennsylvania State University, State College, Pa., Scientific Report No. 73, Contract No. AF 19(122)-44, ASTIA No. AD-55983; 15 December 1954. ABSTRACT: This report is a continuation of previously reported theoretical and experimental investigations. The final results of the experimental program for the investigation of coupling phenomena at 150 kc/sec, which covered a period of some ten months in all, are presented. Conclusions are obtained, from a comparison of the theoretical results and experimental data, regarding the shape of the nighttime D layer in the coupling region and its seasonal and diurnal variations. Sunset D-E region models for July and November, 1953 are proposed. A theoretical recombination coefficient model suggested by Mitra is then applied in order to determine the variation of these models with time of night. Finally, comparison is made both with the conclusions obtained from the data on coupling phenomena and with all other available low frequency data; very good agreement is obtained in all cases. It is concluded that the previously reported theoretical analysis satisfactorily explains the experimental observations, and that it is not necessary to postulate a sharply stratified ionosphere for this purpose. Recommendations for future work, as suggested by this investigation, are outlined. (a-1, b-3, c-1, d-1, e-891, f-Study)

3455. ANONYMOUS, "Test of Whip Type Sense Antenna AT-563/AR for Use on Naval Aircraft," Naval Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-49 740; 21 December 1954. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, d-0, f-Test report)

3456. ANONYMOUS, "Direction of Arrival of Radio Waves," Electrical Engineering Research Laboratories, University of Illinois, Urbana, Illinois, Report No. DF 32, Contract No. N6-ori-07115, ASTIA No. AD-53 511; 31 December 1954. ABSTRACT: Various status reports on project by Bailey, A. D., Dunn, E. J., Hayden, E. C., O'Meara, T. R., Royal, D. E., Smith, R. S., Sydnor, R. L., Webb, H. D., and Yaru, N. (a-4, b-3, c-1, d-1, e-958, f-Project status report. See Abstract No. 3418)

3457. WHALE, H. A., "A Rotating Interferometer for the Measurement of the Direction of Arrival of Short Radio Waves," Proc. Phys. Soc., Part B, vol. 67, p. 553; ca 31 December 1954. ABSTRACT: A method of measuring the bearing angles and the angles of elevation of incoming radio waves is described. In this method two aerials are used, one of which moves in a circular path several wavelengths in diameter. The phases of the radio signals from the two aerials are compared in a system which does not depend on their relative amplitudes and it is shown that this method enables measurements to be made even when there is considerable differential fading between the two aerials. Some experimental records are given yielding the angles of arrival of radio waves. (a-1, b-1, c-1, d-5, e-949, f-Description)

1955

3458. BANERJI, R. B., "The Autocorrelogram of Randomly Fading Waves," J. atmos. terrest. Phys., vol. 6, no. 1; 1955. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Study)

3459. CHENG, D. K., "Effect of Arbitrary Phase Errors on the Gain and Beamwidth Characteristics of Radiation Patterns," Trans. IRE, vol. AP-3, p. 145; 1955. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-Study)

3460. DENISOV, N. G., "The Interaction of Extraordinary Waves in the Ionosphere and the Effect of Multiplication of Reflected Signals," Z. Eksper. Teoret. Fiz., vol. 29, no. 3(9), pp. 380-381; 1955. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Theory)

3461. FEJER, J. A., "The Interaction of Pulsed Radio Waves in the Ionsophere," J. atmos. terrest. Phys., vol. 7, no. 6, pp. 322-332; 1955. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Theory)

3462. FRUEHAUF, H., "Application of Electromagnetic Waves as Navigational Aid," Dresden Technische Hochschule-Wissenschaftlich Zeit, vol. 4, no. 4, pp. 633-653; 1954-1955. ABSTRACT: Application of electromagnetic waves as navigational aid; discussion of different systems, including hyperbolic methods, Decca Navigator, loop direction finders, take-off and landing systems, and radio measurement of radar techniques. (a-3, b-1, c-4, d-4, e-0, f-Discussion)

3463. GREIF, R., AND HUBER, F. R., "Transmitting, Receiving and DF Antennas for Air-Traffic Control in the Ranges 100-156 Mc/s and 235-470 Mc/s," Rohde & Schwarz Mitt., no. 7, pp. 441-456; 1955. ABSTRACT: Not available. (a-4, b-3, c-4, d-4, e-0, f-0)

3464. HIBBERD, F. H., "Ionospheric Self Interaction of Radio Waves," J. atmos. terrest. Phys., vol. 6, no. 5, pp. 268-279; 1955. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

3465. JANCEL, R., AND KAHAN, T., "Theory of Coupling of Ordinary and Extraordinary Waves in an Inhomogeneous and Anisotropic Plasma and the Conditions of Reflection. Application to the Ionosphere," J. Phys. Radium, vol. 16, no. 2, pp. 136-145; 1955. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-Theory)

3466. KASUYA, I., "Some Considerations of Measurements of Bearings of the Incoming Short Waves," Rep. Ionosph. Res., Japan, IX, vol. 1, pp. 45-49; 1955. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-Study)

3467. MIYA, K., AND KANAYA, S., "Radio Propagation Prediction Considering Scattering Wave on Earth's Surface," Rep. Ionosph. Res., Japan, IX, vol. 1; 1955. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-Study)

3468. WHALE, H. A., "Widespread Diurnal Variations of the Effective Slope of the Ionosphere," Nature, vol. 175, p. 77; 1955. ABSTRACT: Over a period of twelve months, measurements have been made at Seagrove Radio Research Station of the bearing and elevation angles of radio signals received from two transmitting stations at about the same distance but in directions differing by almost 90° from the receiving station. From these measurements the effective slopes of the ionosphere have been found to be related at places about 1,500 km. apart, and the average diurnal variation of these slopes has been measured. (a-1, b-2, c-1, d-5, e-0, f-Experimental analysis)

3469. BLOK, H., AND RIETVELD, J. J., "Inductive Aerials in Modern Broadcast Receivers," Philips tech. Rev., vol. 16, pp. 181-194; January 1955. ABSTRACT: As early as 1939 Philips marketed a radio receiver (902A) with a single-loop aerial based on the fact that an inductive aerial is less sensitive to interference than a capacitive aerial, and that the aerial-effect of an inductive aerial is diminished by reducing the number of turns. The later development of Ferroxcube enabled the dimensions of the aerial loop system to be drastically reduced. The Ferroxcube antenna or ferroceptor is discussed, and the directional effect, the sensitivity, and the signal-to-noise factor and the effective height are examined. (a-5, b-1, c-1, d-12, e-0, f-Survey)

3470. TAYLOR, T. T., "Design of Line-Source Antennas for Narrow Beamwidth and Low Side Lobes," Trans. IRE, vol. AP-3, no. 1, pp. 16-28; January 1955. ABSTRACT: It is well known that the phenomenon of radiation from line-source antennas is very similar to that of the diffraction of light from narrow apertures. Unlike the optical situation, however, antenna design technique permits the use of other-than-uniform distributions of field across the antenna aperture. Line source synthesis is the science of choosing this distribution function to give a radiation pattern with prescribed properties such as, for example, narrow angular width of the main lobe and low side lobes. In the present article the mathematical relationships involved in the radiation calculation are studied from the point of view of function theory. Some conclusions are drawn which outline the major aspects of synthesis technique very clearly. In particular, the problem of constructing a line source with an optimum compromise between beamwidth and side-lobe level (analogous to the Dolph-Tchebycheff problem in linear array theory) is considered. The ideal pattern is $\cos \pi \sqrt{u^2 - A^2}$, where $u = (2a/\lambda) \cos \theta$, a is the half-length of the source, and $\cosh \pi A$ is the side-lobe ratio. Because of theoretical limitations, this pattern cannot be obtained from a physically realizable antenna; nevertheless its ideal characteristics can be approached arbitrarily closely. The procedure for doing this is given in detail. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

3471. ANONYMOUS, "Evaluation of AN/ARA-25 Quadrantal Error Compensation," Naval Air Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-58 735; 7 January 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

3472. GUSTAFSON, W. E., DEVANEY, T. E., AND WHITTEMORE, L. L., "Broadband 180-Degree-Sector Antenna," U.S. Navy Electronics Laboratory, San Diego, California, ASTIA No. AD-66683; 19 January 1955. ABSTRACT: It is the general practice of shore stations to construct vertically polarized antennas with omnidirectional characteristics. Omnidirectionality is desired under certain circumstances but in many cases the necessary coverage is confined to a sector of 180° or less. In these latter cases the adoption of sector antennas can enhance the efficiency of both transmitting and receiving stations. In order to take advantage of this possible efficiency increase, the Bureau of Ships assigned to the U.S. Navy Electronics Laboratory the problem of developing an antenna array having a beam coverage of 180° at the 3-db points. The design was to be adaptable to either transmitting or receiving stations and was to cover a frequency range of 2 to 1 or better. The array was to match a 75-ohm transmission line within a 3-to-1 VSWR over its normal operating range. Its efficiency was to be 70 percent or better. The antenna structure was to be kept as simple and small as practicable. During the development of the 180-degree-sector antenna, several types were considered in an attempt to obtain an efficient array which would be reasonably simple to construct and of such dimensions as to be of practical value. The standard sleeve antenna and flat-sheet-type reflecting screen were finally selected. This combination showed promise of producing the desired results. Scale models (1:30) of a 4-to-12-Mc array were constructed. These consisted of a standard sleeve-type antenna and reflectors of various heights and widths. Half-inch-mesh hardware cloth, galvanized after weaving, was used to fabricate the reflectors. Spacings between the antenna and reflector were also varied. It was determined through impedance measurements that usable VSWR's were unobtainable at spacings much under 5/32 wavelength (λ), at a base frequency of 120 Mc. Too narrow beamwidths were encountered when the reflector was too wide. The opposite was true when too narrow a reflector was employed. When the spacing was too great, beam splitting occurred at the higher frequencies. When a reflector of insufficient height was used, back radiation increased, while a reflector of too great a height contributed practically nothing to the effectiveness of the array. The dimensions that appeared most promising for the reflector were: 9/32 λ height, 5/32 λ width, and 5/32 λ spacing, all at a base frequency of 120 Mc, as shown in figure 1. This array produced very good results over better than a 2-to-1 frequency range, with the beam becoming too broad at the higher frequencies and splitting above 2.5 to 1. Representative azimuthal directivity patterns taken on this array are shown in figure 2. All directivity patterns are shown with both model frequencies and full-scale frequencies for a 4-to-12-Mc array. Impedance measurements taken on this same model showed the VSWR would be almost within 3 to 1 from 120 to 360 Mc. (a-1, b-3, c-1, d-1, e-908, f-Description)

3473. JONES, R. E., "Ionosphere Research," Pennsylvania State College, Ionospheric Research Laboratory, Final Report, Contract No. AF 19(122-124); 31 January 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3474. BELROSE, J. S., "Ferromagnetic Loop Aerials for Kilometric Waves," Wireless Engr., vol. 32, no. 2, pp. 41-46; February 1955. ABSTRACT: The design of ferromagnetic loop aerials for the frequency range 80-200 kc/s is approached with a view to maximizing their S/N ratios. These considerations are related to experimental results on loop aerials using ferromagnetic cores of variour types. Sensitivities of 1μV/m (for receiver bandwidths of 100 c/s) for a 10 db S/N ratio are shown to be possible. (a-1, b-1, c-1, d-5, e-679, f-Experimental results)

3475. BOWEN, K. C., "Sources of Error in U-Adcock High-Frequency Direction-Finding," Proc. IEE, Part B, vol. 102, p. 529; February 1955. ABSTRACT: It is well known that errors in hf direction-finding using U-Adcock systems arise from a number of independent causes. Experiments have been carried out to assess their relative importance, and statistical methods have been used to calculate the respective contributions to the total variance of error in a series of typical check bearings on known transmitters. The variance component, normally attributed to wave-interference errors, has been studied particularly, and the contributions from observational error and the effect of ground resistivity variations over the D/F site have been estimated. (a-2, b-1, c-1, d-1, e-0, f-Analysis)

3476. COX, J. W., AND DAVIES, K., "Oblique Incidence Pulse Transmission," Wireless Engineer, vol. 32, pp. 35-41; February 1955. ABSTRACT: The pulsed multi-frequency ionospheric recording technique was used to obtain oblique incidence, delay time frequency records. Sweeps were taken at points 2,360 km apart during the period June to August 1949. Sweeps obtained during quiet and disturbed conditions are presented showing N type echoes, scatter propagation at frequencies about the muf and spread echoes. It was found that reciprocity held to a first approximation and that the strength of the Pedersen ray was often quite appreciable at frequencies well below the muf. A test of the oblique-incidence transmission theory, as developed by Millington, has been made by converting vertical h'-f records to equivalent oblique records and comparing these with observation. There is good agreement between theory and observation. It is shown that the Sellmeyer dispersion formula is more accurate for the calculation of maximum usable frequencies than the Lorentz formula. (a-1, b-2, c-1, d-5, e-0, f-Descriptive analysis)

3477. EAKIN, J. H., "Resonant Loop Antenna for v. h. f. Direction Finding," Electronics, vol. 28, no. 2, pp. 172-174; February 1955. ABSTRACT: The loop described tunes from 30-40 Mc/s. It consists of a single turn of wire in an electrostatic screen of 13 in. diameter. A push-pull amplifier is built on to the base of the loop. This serves to connect the balanced output of the loop to the unbalanced 50Ω feeder leading to the main receiver. Bearing resolutions claimed are from ±2 to ±5° depending upon S/N level. (a-2, b-2, c-1, d-1, e-0, f-Description)

3478. GRIMMET, C. A., "Improving Ferrite Cored Antennas," Tele-Tech and Electronic Industries, vol. 14, no. 2, p. 84; February 1955. ABSTRACT: The paper discusses ferrite antenna principles of operation, and design aspects such as effective permeability, core area, windings, core material, shift correction. Production considerations and a few other considerations are given. (a-4, b-2, c-1, d-1, e-0, f-Description)

3479. KALLMANN, H. K., "A Study of the Structure of the Ionosphere," Rand Corporation, Santa Monica, California, February 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

3480. LEPPERT, M. L., SHANAHAN, F. J. AND WORSLEY, D. A., "Balloon Elevated Antennas," NRL Report 4490; February 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3481. PARKS, W. J., "Direction Finders, Automatic Lightweight, Airborne," Magnavox Company, Fort Wayne, Indiana, Quarterly report, Contract DA 36-039-sc-63087, ASTIA No. AD-39 008 (Serial). February 1955. ABSTRACT: Progress reports, Nos. 1-3 covering period from 31 July 1954 to 28 February 1955. The above "serial" AD document is augmented by AD Nos. 50 478 and 66 568. (a-4, b-3, c-1, d-1, e-0, f-Progress reports)

3482. VON HIPPEL, A. R., WESTPHAL, W. B., AND MILES, P. A., "Dielectric Analysis of Ferrites and Their Appraisal as Radome Materials," Wright Air Development Center, WADC Technical Report No. 55-149, ASTIA No. AD-76793; February 1955. ABSTRACT: An extensive theoretical and experimental investigation has been undertaken on the electric and magnetic response of ferrites from static fields up to the frequencies of the optical region. The report opens with an Introduction linking this study to the special needs of the Air Force, and with a General Discussion (Chapter I) providing the scientific reference frame to the prior art. Chapter II formulates the theoretical concepts and language which are a prerequisite for a discussion of the electric and magnetic phenomena over the whole frequency range. Chapter III provides the basic concepts on the ferrites. Chapter IV describes the experimental techniques used in this work. Chapter V gives the methods of dielectric analysis and Chapter VI our results and their interpretation. Finally, Chapter VII evaluates our data for Radome applications, shows why these ferrites will not accomplish the purpose, and suggests alternative solutions. (a-1, b-3, c-1, d-1, e-907, f-Study)

3483. ZAKHEIM, J., "Use of Phase Measurements in a System for the Guiding and Location of Moving Objects," Onde Elect., vol. 35, pp. 137-141; February 1955. ABSTRACT: Discussion of the O. N. E. R. A. radio-alignment system, in which a cw signal radiated by the moving object is received on the ground by a system having two pairs of antennas, one pair spaced $\lambda/2$ apart, the other separated by a distance $>> \lambda$. The phase difference between signals received by the individual antennas can be measured with high accuracy and the position of the moving object hence determined. More elaborate equipment measures the speed of the object and enables its trajectory to be corrected. (a-3, b-2, c-3, d-3, e-0, f-Discussion)

3484. WEBB, H. D., "Some Factors Affecting Phase and Gain Alignment in Matched Channel Receivers," Electrical Engineering Research Laboratories, University of Illinois, Urbana, Illinois, Technical Report No. 21, Contract No. N6ori-07115. See also Department of Commerce PB119982: ASTIA No. AD-55 342; 15 February 1955. ABSTRACT NO. 1: It is recognized that perfect phase and gain matching of the channels in multichannel receiving systems cannot be realized in practice. For this reason equations for percent of ellipsing and bearing indication are developed for simple RLC coupling, cascaded RLC stages, double-tuned transformer coupling, an injection-type system, and RLC stages under transient signal conditions. These equations are developed in terms of gain and phase mismatch and also in terms of gain, R, L, and C mismatch. Curves are shown for percent of ellipsing and bearing error for various conditions for the RLC and injection systems. The equations show that for low errors in the sine wave signal reception case $\ell c \approx 1$, $rg \approx 1$, and $r/\ell \approx 1$, where ℓ, c, r, and g represent the ratios of inductances, capacitances, resistances, and mutual conductances for the two corresponding stages in two channels. For pulse or transient reception the requirement is somewhat more severe: $\ell \approx 1$, $c \approx 1$, $r \approx 1$, and $g \approx 1$. The percent of ellipsing for given amounts of mismatch is less if $\ell c = 1$. The percent of ellipsing for given amounts of mismatch may be made less by using an injection-type system, but gains must be corrected by means of AGC in order to correct the bearing indication. A brief discussion of the application of the results to practical matched channels systems is given. ABSTRACT NO. 2: In order to find criteria that could be used to determine the necessary precision of match for various circuit components or parameters, some simple types of circuits were analyzed mathematically in order to find expressions for percent of ellipsing, expressed as 100 times the ratio of the minor axis of the ellipse to the major axis, and for bearing indication, both in terms of circuit parameters. The results of the work are given in the body of the paper, with the detailed analyses in appendices. The various expressions derived are expressed in a manner that is believed to be useful in deciding tolerance limits for the design of matched channel receiving systems. (a_1-1, a_2-3, b-3, c-1, d-1, e-364, f-Theory)

3485. ANDERSON, W. G., "The Accuracy of the VHF Omni-Range System of Aircraft Navigation; A Statistical Study," Trans IRE, vol. ANE-2, no. 1; March 1955. ABSTRACT: This paper describes a statistical treatment of the errors encountered in the VHF Omni-Range Navigation System. The first part of the paper consists of a rudimentary discussion of statistical theory which serves to acquaint the reader with the methods used in the second portion of the report. Each of ten different errors are described in terms of a normal distribution function with the parameters $\bar{x}$ and s, the mean and standard deviation respectively. The ten errors are summed up and are compared to the error distribution which was obtained from error data gathered by the pilots of various scheduled airlines. The close agreement justifies the method used. Of the ten errors, only five are significant, and the VOR ground station error is shown to be greater than the sum of the other nine. (a-1, b-1, c-1, d-1, e-345, f-Study)

3486. BATTELLE, R. B., "Study of Helicopter Rotor Modulation of the V-H-F Omnirange Signal," Stanford Research Institute, Stanford, California, Final Report, Contract No. DA 36-039 SC-52668; March 1955. ABSTRACT: This is the final report on a study to determine the nature and extent of the effects of helicopter rotor motion on radio signals in the vhf range. Particular emphasis has been placed on the study of the modulation or distortion of signals of the vhf omnirange (VOR) navigational system, a system that is inherently sensitive to rotor modulation and one in which rotor motion can cause serious bearing errors. Since the helicopter antenna appears to be the most important and most flexible element in the VOR system influencing the degree of rotor modulation, the study has also been directed toward establishing criteria for antenna installations that will minimize the effects of rotor motion. The report covers the techniques of rotor modulation measurement, the effects of antenna design and placement, and the characteristics of the VOR system that determine its susceptibility to rotor modulation. Also included are the results of the model measurements made on two helicopters (the H-19 and H-21) that are typical of the larger present-day single- and twin-rotor configurations. Several measurement techniques have been developed, including magnetic tape recording of the modulation waveform and direct measurement of a selected harmonic of the waveform. The latter procedure can be carried out rapidly, and is particularly suitable when the effect of rotor modulation on a system can be expressed in terms of the relative magnitude of a particular harmonic of the modulation waveform. The extent of the VOR bearing disturbance due to rotor modulation is shown to be a function of the frequency and relative amplitude of the harmonics of the modulation waveform that fall nearest to 30 and 60 cps, and of the VOR indicator that is used. Under the least favorable rotor speed conditions (blade passage rate nearly equal to a submultiple of 30 cps), a 3% harmonic component at nearly 30 cps will produce a bearing deviation of ±6 deg. Of the two helicopters considered in detail, the third harmonic of the blade passage rate of the H-19 falls at or very near 30 cps, whereas the modulation harmonics of the H-21 normally miss that frequency by a wide margin. The standard ram's-horn antenna installation on top of the helicopter fuselage generally results in objectionable modulation. A reduction of modulation due to rotor motion can be obtained by using the fuselage as a shield and installing the antenna on the bottom of the fuselage. A balanced horizontal loop antenna on the bottom of the fuselage was found to be particularly effective in reducing rotor modulation. In addition, minor modifications in the VOR indicator circuit can reduce the range over which interference will occur. It is doubtful, however, if rotor modulation interference can be eliminated entirely except by avoiding the rotor speeds that generate critical modulation frequencies; a simple warning marker on the rotor speed indicator would help helicopter pilots avoid

these critical speeds at times when VOR bearing information is desired. (a-1, b-3, c-1, d-1, e-284, f-Study)

3487. BLAKELY, J. R., "U.S. Coast Guard Automatic Direction Finder Model RD 132," Trans. IRE, vol. CS-3, no. 1, pp. 16-22, March 1955. ABSTRACT: The RD-132 quickly and automatically provides a means of obtaining the relative bearings of distant radio transmitters for navigational purposes. Designed for general shipboard and shore-station use, it is light, compact and adaptable to any required type of installation. (a-1, b-1, c-1, d-1, e-0, f-Description)

3488. HARTSFIELD, W. L., "Observation of Distant Meteor-Trail Echoes Followed by Ground Scatter," J. Geophys. Research, vol. 60, p. 53; March 1955. ABSTRACT: Observations of backscatter on 13.7 Mc over a southeasterly path from Sterling, Virginia, revealed the existence of meteor-trail reflections just ahead of the main body of the backscatter, demonstrating that the latter was from the ground in these instances. The existence of apparent two-hop backscatter without the appearance of one-hop was noted in a number of cases. Possible reasons for this behavior are discussed. (a-1, b-1, c-1, d-1, e-0, f-Observation experiment)

3489. KASUYA, "Some Considerations of Measurements of Bearings of the Incoming Short Waves," Rep. Ionosphere Res., Japan, vol. 9, no. 1, pp. 45-49; March 1955. ABSTRACT: Measurements of the arrival directions of standard 4 Mc/s transmission from Koganei, Tokyo, were made at 4 radio-wave monitoring stations (Kushiro, Sendai, Iwaoka, and Miyakonojo) during February 1-7 and March 18-24, 1954. The results obtained are shown graphically and indicate that when the receiving station is within the skip zone, the direction-finding service is beset with difficulties owing to scattered waves being received. The range of variation of the bearings of the incoming waves has a fairly positive correlation with the ratio of the frequency used to the M.U.F. The lateral deviation of a sky wave propagated over short distances may be interpreted in terms of the direction of the circuit relative to the direction of the inclination of the surface of equal electron density in the ionosphere, which tilts appreciably for the wave concerned at twilight or in case of disturbances. A model illustrating this relation between arrival bearing and tilt of the equal-electron-density surface is described and illustrated by several examples. (a-2, b-1, c-6, d-6, e-0, f-Study and analysis)

3490. MCCUE, C. G., "H.F. Direction Finding," Wireless Eng., vol. 32, pp. 79-81; March 1955. ABSTRACT: Some night-time D/F observations were made at the Radio Research Organization's stations at Slough and Winkfield on hf radio signals from Sterling, Virginia, U.S.A., during February and March 1953. The purpose of these measurements was to test whether the observed bearings depended upon the direction of the transmitting aerial beam. No significant correlation of this nature was disclosed. (a-1, b-2, c-1, d-5, e-680, f-Experimental results)

3491. BICKMORE, R. W., "On the Transmission between Two Rectangular Apertures," Research and Development Laboratories, Hughes Aircraft Company, Culver City, California, Scientific Report No. 1, Contract No. AF 19(604)-1317, ASTIA No. AD-60756; 1 March 1955. ABSTRACT: The transmission between two rectangular apertures is examined as a function of their sizes, separation, excitation functions, and surface shapes, with Fresnel approximations made throughout. Relations are derived which show when it is advantageous to focus the apertures by curving about a spherical surface. This theory is then applied to the problem of Fraunhofer pattern measurement in the Fresnel zone. (a-1, b-3, c-1, d-1, e-906, f-Analysis)

3492. WILLIAMS, J. R., "Utilization of Electromagnetic Propagation Parameters in Topographic Mapping," Batelle Memorial Institute, Columbus, Ohio, Seventeenth Interim Report, Contract No. DA-44-00 En g-1931, ASTIA No. AD-74 312; 1 March 1955. ABSTRACT: This is a report Bibliography on radio ranging and related subjects. (a-4, b-3, c-1, d-1, e-934, f-Bibliography)

3493. ANONYMOUS, "Evaluation of AN/ARN-6 Sense Antenna Installation on Model AJ Airplanes," Naval Air Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-60 205; 25 March 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

3494. ANONYMOUS, "Antenna AT-269 (XA)/ARN-6A," Bendix Radio Division, Bendix Aviation Corporation, Baltimore, Maryland, Interim Report Nos. 8-16, Contract No. AF 33(038)23678. Reports with this title include: Interim engineering rept. no. 8, 30 November 1952, AD-2936, Interim engineering rept. no. 16, 31 March 1955, AD-61 786. ABSTRACT: Where information pertaining to these reports is available, abstracts are carried according to chronology. (a-4, b-3, c-1, d-1, e-0, f-ASTIA No. serial listing)

3495. ANONYMOUS, "Short Range D/F Plotting Equipment," Bendix Aviation Corporation, York, Pennsylvania, Interim Reports, Contract No. AF 30(602)1172. Reports with this title include: Interim engineering rept. no. 1, 10 June-31 July 1954, AD-44 383; Interim engineering rept. no. 2, August 1954, AD-48 134; Interim engineering rept. no. 3, September 1954, AD-48 133; Interim engineering rept. no. 4, 1-31 October 1954, AD-56 975; Interim engineering rept. no. 5, 1-30 November 1954, AD-54 227; Interim engineering rept. no. 6, 1-31 December 1954, AD-56 974; Interim engineering rept. no. 7, 1-31 January 1955, AD-61 500; Interim engineering rept. no. 8, 1-28 February 1955, AD-67 745; Interim engineering rept. no. 9, 1-31 March 1955, AD-78 557; Interim engineering rept. no. 10, 1-30 April 1955, AD-66 729. ABSTRACT: Where information pertaining to these reports is available, abstracts of same are carried according to chronology. (a-4, b-3, c-1, d-1, e-0, f-ASTIA No. serial listing)

3496. CLARKE, C., AND HARRISON, V. A. W., "Low-Frequency Direction Finder," Wireless Eng., vol. 32, pp. 109-114; April 1955. ABSTRACT: The instrument described is a simplified and improved version of a type of direction finder in current operational use for locating thunderstorms. Signals from crossed-loop aerials, 1 m^2 area, are amplified in matched amplifiers, tuned to 10 kc/s and applied to the crt. In observations on atmospherics the tube is brilliance-modulated by a pulse derived from the atmospheric. When a network of stations, linked by telephones, is used, the atmospheric received at a selected station also causes an audible pulse to be passed over the telephone lines; this facility improves the co-ordination of the observations. If required, a sense amplifier may be incorporated to remove the 180° ambiguity which normally occurs in the bearings; the aerial for this unit is a short vertical rod. (a-1, b-2, c-1, d-5, e-681, f-Experimental results)

3497. DUPUIS, J., "Loop Aerials Using Ferrites," Onde Elect., vol. 35, pp. 379-393; March/April 1955. ABSTRACT: The characteristics of loop antennas wound on ferroxcube cores are discussed and constructional details are given. (a-3, b-2, c-3, d-3, d-0, f-Description)

3498. ECKART, G., "On the Relationship between the Distribution of Intensity in Radiating Systems and Their Directional Characteristics," Arch. elekt. Uebertragung, vol. 9, no. 4, pp. 177-180; April 1955. ABSTRACT: It is shown on the basis of the analytical theory of the Fourier transformation that, for linear and infinitely plain radiating systems the relationship between the amplitude distribution on the radiator and the directional radiation pattern is unique. The problem of scattering when a zone of small disturbances of the permittivity, or that of the velocity of sound, is struck by a wave, is considered for the case of electric and acoustic waves respectively. A mathematical solution is given for the determination of the distribution of the disturbing intensities; this is possible to obtain when an infinite family of directional characteristics of the scattering field is plotted by measurement. (a-3, b-1, c-4, d-4, e-0, f-Theory)

3499. TRAVERS, D. N., "Spacing-Error Analysis of the Eight-Element Two-Phase Adcock Direction Finder," IRE Trans., vol. AP-3, no. 2, pp. 63-65, April 1955. ABSTRACT NO. 1: The sensitivity and spacing error limitations of the conventional 4-element array requires the use of several arrays in order to cover a large portion of the frequency spectrum. An 8-element array is described which has an operating frequency range considerably greater than that of the familiar Adcock, while still maintaining the simplicity of 2-phase goniometer azimuth scanning. Spacing error curves are plotted and an optimum design is selected. It is shown that element spacing values greater than one wavelength are possible, and that frequency coverage is sufficiently great to render considerations other than spacing error the limiting factors. ABSTRACT NO. 2: In the array described the elements are arranged on a circle with alternate angular separations of 54° and 36°; the operating frequency range is 20:1. Element-spacing values $> \lambda$ may be used; bandwidth is limited by other factors, such as antenna impedance or vertical pattern, rather than spacing error. (a_1-2, a_2-5, b-1, c-1, d-1, e-356, f-Analysis)

3500. CROMBIE, D. D., "Doppler Spectrum of Sea Echo at 13.56 Mc/s," Nature, vol. 175, pp. 681-682; 16 April 1955. ABSTRACT: The Doppler frequency shift of radio waves reflected from the sea

surface at 13.56 Mc./s. has been recorded. Such records show the following unexpected features: (a) the frequency of the principal component (as initially obtained by measurement of the length of individual cycles on the record) is surprisingly constant at about 0.38 c./s., irrespective of wind conditions and state of the sea; (b) the records show that the range of frequencies present is small. Spectrum analysis of the records made with an Admiralty wave analyser confirmed these findings. A tentative explanation of these features can be offered if it is assumed that the sea waves act as diffraction gratings. It is known that, under a given wind, sea waves of all lengths up to a maximum dependent on the wind velocity are generated. Of this multiplicity of waves, some travelling radially to the antenna will have a wave-length L and will reflect back a large signal when $L = \lambda/2$, λ being the radio wave-length. Since the velocity v of a sea wave of length L is given by

$$v = \frac{g}{2\pi} L,$$

g being the acceleration due to gravity, then the Doppler shift Δf of this enhanced signal will be

$$\Delta = \frac{2v}{\lambda} = \frac{2}{\lambda} \cdot \frac{g}{2\pi} \cdot \frac{\lambda}{2} = \frac{g}{\pi} \cdot \frac{1}{\lambda}$$

In the present case, $\lambda = 22.1$ m., $g = 9.81$ m./sec.^{2}, gives $\Delta f = 0.376$ c./s., agreeing closely with the value for $\Delta f = 0.38$ c./s. It might also be expected that components of nonsinusoidal waves of wave-length $L = n\lambda/2$, n being an integer, travelling radially towards the antenna, would cause reinforcement and thus large reflected signals. These would then have Doppler shifts

$$\Delta f = \frac{g}{\pi}\frac{n}{\lambda}.$$

The subsidiary peak at a frequency of 0.54 c./s. $= 0.38\sqrt{2}$ thus suggests that this is due to waves having a length $L = \lambda$. Both the peaks depart considerably from line spectra. At first sight this could be explained by considering that the relatively short waves of length $L = \lambda/2$ are superimposed on the crests of much longer waves and thus have velocities dependent on the lengths and heights of the larger waves. An alternative explanation of the shape of the spectra is that the sea waves exist in short trains. The first-order ($n = 1$) diffraction patterns of short sea-wave gratings of variable spacing L have been calculated, and by the use of the relation

$$\Delta f = \frac{2}{\pi} \cdot \frac{g}{2\pi} \cdot L,$$

may be drawn as Doppler shift spectra. The agreement is considered to be good. This may be of interest to oceanographers, since the explanation does not completely conform with accepted ideas of the behaviour of sea waves. The explanation above would suggest that by the use of radio waves of lower frequency longer sea waves would be observed, and that the use of an equipment of variable frequency would result in a sea-wave spectrometer. At very high frequencies under extremely calm conditions, however, when sea waves of length comparable with the radiowave-length are dominate, similar results to those found here at lower frequencies should be obtained. It is interesting to note that, because capillary waves have a velocity which decreases with wavelength, then the Doppler shift for radio wave-lengths less than 4 cm. under very calm conditions should increase more rapidly with decreasing wave-length than at longer radio wave-lengths. Under normal conditions, however, when waves of much greater length are dominant, then in the expression for Doppler shift

$$\Delta f = \frac{g}{\pi} \cdot \frac{n}{\lambda},$$

n will be large and a continuous spectrum may result if the mechanism suggested above is responsible. (a-1, b-?, c-1, d-5, e-0, f-Theory)

3501. STRUSZYNSKI, W., "Effect of Interaction between Aerial Elements on the Performance of Eight-Aerial Adcock Systems," ASRE Technical Note AX/55/7; 27 April 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Analysis)

3502. LEVIS, C. A., AND TAI, C. T., "Flush Mounted Antennas for Direction-Finding and ECM," The Ohio State University Research Foundation, Columbus, Ohio, Report No. 486-40, Contract No. AF 18(600)85, ASTIA No. AD-69198; 30 April 1955. ABSTRACT: The problem of coupled cylindrical antennas of unequal sizes, both in length and in diameter, has received considerable attention in the last few years. Significant contributions to the subject have been made by Uda and Mushiake in their study of Yagi-Uda antennas. The method used in their theoretical study of the problem can be considered as an extension of Hallen's original work on a single antenna. A similar method was used by King and Harrison in their treatment of two coupled antennas of identical size. While much useful information has resulted from the extensive work of Uda and Mushiake, it seems desirable to make an independent approach to the problem in order to check the accuracy of their solution. This is particularly true because the so-called first-order solution based upon Hallen's method sometimes does not yield results comparable to those found by other methods. The method described in this paper is an extension of Storer's variational method, originally used for the treatment of a single cylindrical antenna. An extension proposed by Begovich gives variational formulas for coupled slots, provided they are small electrically. Although no numerical values are yet available for the solution of the Yagi-Uda antenna by this new method, we should like to present here a general derivation of the essential formulas involved in the method. (a-1, b-3, c-1, d-1, e-902, f-Study)

3503. TOOHIG, M. F., DAVIS, D. W., ET AL., "Iatron Tube Development for AN/ARD-10(XA-1)," Capehart-Farnsworth Corporation, Fort Wayne, Indiana, Quarterly Report; 30 April 1955. Contract No. AF 33(600)25523, ASTIA No. AD-65 297; 30 April 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3504. ANONYMOUS, "Antenna Group OA-436 (XE-1)/TLR-1 Broadly Directional (Development Model)," Gabriel Labs, Needham Heights, Massachusetts, Quarterly Progress Report Nos. 1-10, 8 November 1952 to 8 May 1955, Contract No. DA 36-039-sc-42602. Reports with this title include: Quarterly progress rept. no. 1, 8 Nov 52 - 8 Feb 53, AD-10 936; Quarterly progress rept. no. 2, 8 Feb - 8 May 53, AD-15 899; Quarterly progress rept. no. 3, 8 May - 8 Aug 53, AD-33 272; Quarterly progress rept. no. 4, 8 Aug - 8 Nov 53, AD-30 345; Quarterly progress rept. no. 5, 8 Nov 53 - 8 Feb 54, AD-40 591; Quarterly progress rept. nos. 6-7, 8 Feb - 8 Aug 54, AD-60 766; Quarterly progress rept. no. 8, 8 Aug - 8 Nov 54, AD-71 672; Quarterly progress rept. no. 9, 8 Nov 54 - 8 Feb 55, AD-70 557; Quarterly progress rept. no. 10, 8 Feb - 8 May 55, AD-74 614. ABSTRACT: Where information pertaining to these reports is available, abstracts will be carried in collection according to chronology. (a-4, b-3, c-1, d-1, e-0, f-AD-Serial listing)

3505. ANONYMOUS, Mullard Ferroxcube. England: Mullard Limited. Section 5, Chapter 5, "Ferroxcube Rods for Aerials," pp. 91-95; May 1955. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-Ferromagnetics)

3506. KOEHLER, A., "Helical Antennas for Direction Finding Purposes in Decimeter Range," Electronische Rundschau, vol. 9, no. 5, pp. 190-195; May 1955. ABSTRACT: Calculation of dimensions, with particular reference to structures of 1 wavelengths turn length; origin and formation of radiation directivity pattern and calculation for various helical forms; conditions for obtaining optimal directivity effect and usfficiently stable input impedance; advantages of helical antennas. (a-3, b-2, c-4, d-4, e-0, f-Description)

3507. STORER, J. E., "Technical Report on Impedance of Thin Wire Loop Antennas," Harvard University, Cruft Laboratory, Contract No. N5onr-76, Task Order No. 1, Tech Rpt No. 212; 1 May 1955. ABSTRACT: Hallen integral equation for current and impedance of thin wire loop antenna is solved using Fourier Series; extensive tables of theoretical loop antenna impedances are presented which (for one case tested) are in satisfactory agreement with experiment; graphical results also given which facilitate evaluation of current distribution. (a-3, b-3, c-1, d-1, e-0, f-Theory)

3508. ANONYMOUS, "UHF Direction Finder Antenna," Balco Research Laboratories, Newark, New Jersey, Final Report; Contract AF30(602)1186; ASTIA No. AD-68 895; 13 May 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Final report on contract)

3509. ALFORD, A., ADAMS, G. J., AND PARISI, F. E., "A Theoretical Investigation of the Effects of Reflections from Buildings on Localizer and Glide Path Courses," Andrew Alford, Consulting Engineers, Boston, Massachusetts, Final Engineering Report, Contract No. AF33(038)-23700; June 1955. ABSTRACT: A large number of instrument landing systems have been installed and successfully operated by the CAA over a period of years at major airports throughout the United States. Satisfactory localizer and glide-path courses have been obtained in spite of the large number of hangars and other buildings at major airports. This degree of success is

believed to have been due largely to the proper selection of runways and the use of localizer arrays having as many as ten elements when conditions require. Experience during the past years seeems to show that the course of the equisignal glide path is rarely affected by hangars or other buildings normally found at an airport. Such course irregularities as are sometimes found are more often due to irregularities of the ground surface in the area where the relevant signal is reflected from ground. Course bends in the localizer courses are fairly common when a portable equipment such as MRN-1, having an antenna of small aperture designed for use at temporary airports without large buildings is installed at one of the major airports with a large number of big hangars. Serious course bends have been encountered even with the 8 or 10 loop localizers under some circumstances and particularly when the localizer sites were improperly chosen. Even these sites would probably have been satisfactory had the dual localizer with a large aperture been available at the time. The theoretical investigation described was made in the hope that it would be of assistance in selecting the localizer and the glide path sites as well as the type of equipment which is most suitable for a given site. There seems to be no record of a complete, direct experimental study of the reflection properties of hangars and of other typical structures normally encountered at airports. There is some good indirect evidence that at 110 mc hangar walls facing runways behave more or less like metal sheets of comparable size. Even such indirect experimental evidence is meager at 330 mc. In the study of the effects of reflected signal on the localizer courses it is very important to note that there are vast differences among several types of localizers. A three loop localizer with an auxiliary 2 loop antenna such as the AN/MRN-1 radiates a substantial amount of 90 cycle sideband signal in all directions on one side of the localizer course and a similar amount of 150 cycle sideband signal on the opposite side of the course. Thus, almost any building at the airport is illuminated to some degree by at least one of the two types of sideband signals. On the contrary, a dual localizer with a 90 foot primary array sends important radiation only into a sector about 15 degrees wide. In this case buildings other than those near the approach end of the runway are not illuminated and consequently cannot reflect any appreciable signal. Standard CAA 8 and 10 loop localizers as well as the older 9 and 7 loop versions fall between the MRN-1 and the dual localizer. (a-1, b-3, c-1, d-1, e-941, f-Study report)

3510. KALMUS, H. P., "Direction Sensitive Doppler Device," Proc. IRE, vol. 43, no. 6, pp. 698-700; June 1955. ABSTRACT: Simple double doppler device makes it possible to determine direction of motion in addition to measuring velocity; same principle can be employed to measure distances, temperature, or small frequency differences; features of single antenna device with gyrator, and single antenna single detector device; application for moving target indication. (a-3, b-1, c-1, d-1, e-C, f-Description)

3511. ZUHRT, H.,"Radiation Resistance and Gain of Rhombic Aerials with an Approximation for Radiation Damping,"Arch. elekt. Urbertragung, 9, no. 6, pp. 255-258; June 1955. ABSTRACT: Formulae and curves are derived for the radiation resistance and gain of rhombic aerials as a function of the aerial data. An approximate allowance is made for radiation damping. (a-2, b-2, c-4, d-4, e-0, f-Mathematical analysis)

3512. ANONYMOUS, "Study Phase Engineering Report," Cubic Corporation, San Diego, California, Contract No. AF 08(606) 785, ASTIA No AD-64 847; 1 June 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3513. ABEL, W. G., DEBETTENCOURT, J. T., ROCHE, J. F., AND CHISHOLM, J. H., "Investigations of Scattering and Multipath Properties of Ionospheric Propagation at Radio Frequencies Exceeding the MUF," Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Massachusetts, Technical Report No. 81, ASTIA No. AD-76 494; 3 June 1955. ABSTRACT: This report presents some results of studies of ionospheric forward-scatter propagation at frequencies exceeding normal MUF in the high HF and low VHF range for the purpose of investigating potential point-to-point communications. Data from approximately 13,000 hours of operation were analyzed from measurement conducted since late 1951 on several frequencies and paths, predominantly 1000 to 1100 miles in length, in mid-latitudes. Signal levels and signal-level characteristics are presented and discussed. Most of the work was conducted at 49.6 Mcps on the 1066-mile Cedar Rapids (Iowa) - Round Hill (Massachusetts) path. Nominal 30-kw transmitters and large rhombic transmitting antennas were employed. The median received signal levels were relatively weak - of the order of 100 db below free-space values. Fading during short periods in the absence of meteoric or sporadic-E enhancements was found to be Rayleigh distributed. For longer periods, of the order of an hour, the fading was essentially Gaussian, although meteoric and sporadic-E enhancements often changed the slope of the fading distribution curves at higher signal levels. In general, the normalized median levels were lower and the diurnal variations less marked than those reported by CRPL for the shorter (773-mile) Cedar Rapids - Sterling (Virginia) path. Seasonally the median levels were higher in winter and summer and lower in spring and fall. There was an indication of lower levels with decreasing sunspot activity. The vertically polarized component of the received signal was some 6 db (median) lower than the horizontally polarized component when using the 2000-foot horizontal rhombic transmitting antenna. Studies made in 1952 of off-path signal levels and measurements of cosmic noise are described. Preliminary analysis of pulse-transmission data for a short path (387 miles) indicates daytime ionospheric-scatter heights of 80 to 90 km. The level and characteristics of 27.8-Mcps signals (Cedar Rapids - Round Hill) are presented and discussed. Additional measurements at 22.9 Mcps are described for the 1059-mile Alpine (New Jersey) - Goose Bay (Labrador) path on transmissions during part of 1953. Observations at 21.6 Mcps are reported for signals received at Limestone, Maine from transmissions at Cincinnati (997 miles); signal-level data and two-stage space-diversity results for a 3-day period of observation in November 1952 are described. (a-1, b-3, c-1, d-1, e-935, f-Study report)

3514. ANONYMOUS, "Direction Finder Set AN/TRD-4A," Department of the Army, Technical Manual No. 11-688; 24 June 1955. ABSTRACT: This manual contains instructions for the installation, operation and maintenance of Direction Finder Set AN/TRD-4A, a complete transportable radio direction-finder station covering the frequency range of .54 to 30 Megacycles and having separate facilities for radio direction-finding, intercept reception, communication reception, field telephone communication, and frequency measurements. (a-4, b-3, c-1, d-1, 3-0, f-Instruction manual)

3515. BAILEY, A. D., HAYDEN, E. C., DUNN, E. J., ET AL., "Status Report on Direction of Arrival of Radio Waves," Engineering Experiment Station, University of Illinois, Urbana, Illinois; Contract No. N6-ori-7115; ASTIA No. AD-71548; 30 June 1955. ABSTRACT: SUMMARY STATEMENTS OF PROGRESS ON THE SEVERAL PROJECTS: "Direction of Arrival of Waves," E. C. HAYDEN, E. J. DUNN, AND R. S. SMITH. The pulse transmitter at Columbus, Ohio, is in operation on its new frequency, 5295 kc. The transmitter license requires a directive antenna. This type of antenna cannot be installed at the present transmitter site. A new location has been obtained, but will not be available until October or November 1955. Meanwhile the transmitter is being operated with a simple horizontal dipole, and permission for such operation on a temporary basis has been requested from the FCC. The improvements in the RDF field station antenna system have been completed. Sensitivity, stability, null depth, and interchannel matching over a band of frequencies all show material improvement when compared to the original system. Some intermodulation occurs in the antenna amplifiers in the presence of strong signals, i.e., signals producing an open-circuit voltage at the base of the antennas of the order of 0.1 to 0.2 volts. A report describing the complete antenna amplifier system is being prepared. The signal display system at the field station is complete. It allows observation of the bearings, polarization, and structure of incoming signals from the Columbus transmitter and from WWV. By means of a gating system, individual portions of a complex signal can be selected for display and observation. The new RDF receiver was designed with sufficient bandwidth to pass 100 microsecond pulses. This was done because the bandwidth of the Canadian CRDF receiver was too small to allow bearings to be obtained on the 100 microsecond pulse signals. The installation of the wider-bandwidth receiver did not bring the improvement that had been expected. It appears that propagation of the signal by way of the ionosphere causes considerable disruption of the phase relationships between the signal sidebands and the carrier. The result is a "squashing" and "spreading" of the pulse shape. "Matched-Channel Amplifier Problems," H. D. WEBB AND T. R. O'MEARA. Work on the receiver with fixed-tuned wide-band RF amplifiers continues, but the work has been confined to the 7 to 10.5 mc band. With the maximally-flat staggered-triplet design, measurements show that the first oscillator image is suppressed 34 to 38 db, but the first IF feed-through is suppressed only 8 to 11 db. Other undesired input signals which were also very bothersome were those at frequencies equal to the first local oscillator frequency plus or minus the second intermediate center frequency. These signals were suppressed from 23 db to 45 db over the frequency range. In all of these cases the suppression of the undesired signals was not large enough. The maximally-flat staggered triplets have been replaced by two cascaded over-staggered pairs in each channel. All three types of suppression have been increased considerably, but no measurement data are as yet available for comparison with the previous results. Qualitative tests do indicate that neither type of IF suppression is good enough with the present design. It is planned to further improve the IF suppression before complete measurements are made on the new ampli-

fiers. It is necessary that this wide-band receiver be made to operate well on one band before any experimental work can be done on panoramic RDF. "High Frequency Transformers," T. R. O'MEARA. Theoretical studies are being completed on the problem of wide-band coupling of vacuum tubes to vacuum tubes, and vacuum tubes to transmission lines, by means of wide-band high frequency transformers. A paper is being prepared on the subject "Wide-Band Power Amplifiers and Transmitters." Design has been started on a cascade type grounded-grid amplifier with a theoretical bandwidth of about 170 mc. "Application of Probability Theory and Statistical Inference to the Radio Direction Finding Problem," A. D. BAILEY AND R. L. SYDNOR. The development work on the improved bearing computer and integrator units has been completed in the laboratory, and the equipment is presently being installed at the direction finder field station. Upon completion of the installation and field testing of the equipment, the principal phase of this investigation will be resumed. A technical report on the improved equipments and techniques is in preparation. Also an abstract of a proposed paper on some of the recent developments has been submitted for review by a possible publisher. Because the abstract summarizes the recent work, it is repeated here as a matter of record. The abstract follows: "A sector-type radio direction finder bearing computer, a bearing integrator, related equipments and techniques are described. The computer samples the intermediate frequency outputs of a twin-channel, high frequency, cathode-ray type radio direction finder at a 25 cps rate. The indicated bearing of each sample is calculated via a logarithmic analog and appears at the output of the computer as a stretched rectangular pulse whose amplitude is proportional to the bearing deviation from a preset reference zero. The recorded sequence of output pulses is a sampled-data presentation of the bearing deviation. The data may be recorded by any oscillographic recording system having adequate bandwidth. The effective linear azimuthal range of the computer is limited to a ±15° sector centered on reference zero. However, a bearing shifter is incorporated which effectively shifts the azimuth of the arriving signal into the linear range of the computer. The systematic error is less than 0.2 degrees. "Immediate statistical reduction of the sampled data is made available by means of a bearing integrator of the long time-constant RC type; it determines the cumulative mean of the sequence of indicated bearings over any period of three minutes or less." "Aircraft RDF and Homing Systems," A. D. BAILEY. The final report on Contract No. N6-ori-07137, under which the work on this project was carried from August 1951 to January 1955, has been completed and distributed. The work will be continued under Contract No. NOas-55-421f until 31 July 1955. "Application of Ionospheric Cross-Modulation in Radio Direction Finding," J. M. ANDERSON. At present it appears unlikely that the field application of this work will be resumed. Mr. Anderson, however, is still working on the theoretical and laboratory experimental aspects of the problem in the Gaseous Electronics Sections. "Magnetic Recording of Bearings," H. D. WEBB, T. R. O'MEARA, AND R. L. SYDNOR. A technical memorandum describing the results of the work to date on this subject has been prepared. (a-1, b-3, c-1, d-1, e-901, f-Various summary reports)

3516. ADEN, A. L., AYERS, W. P., AND MELCHOR, J. L., "Ferrite - Fundamentals," Sylvania Technologist, vol. 8, no. 3, pp. 76-83; July 1955. ABSTRACT: The application of general theory of magnetism to magnetic ferrites; properties with emphasis on composition, structure, and loss mechanisms. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

3517. BAIN, W. C., "On the Rapidity of Fluctuations in Continuous-Wave Radio Bearings at High Frequencies," Proc. IEE, Part B, vol 102, pp. 541-543: Disc., pp. 550-554; July 1955. ABSTRACT: Bearing observations were made with an Adcock direction finder on distant transmitters at a rate of 5/sec. The autocorrelation function of the observations was calculated; it is best represented by an exponential formula with index $-\tau/\tau_0$, where the mean value of τ_0 is 0.75 sec with a standard deviation of 0.51 sec. Expressions are given for the reduction in the variance of bearing error to be obtained by time-averaging. (a-3, b-1, c-1, d-5, e-0, f-Experimental analysis)

3518. BOWEN, K. C., "Sources of Error in U-Adcock High-Frequency Direction-Finding," Proc. IEE, Part B, vol. 102, pp. 529-532: Disc., pp. 550-554; July 1955. ABSTRACT: Statistical methods have been used to calculate the respective contributions to the total variance of error in a series of typical check bearings on known transmitters. The variance component, normally attributed to wave-interference errors, has been studied particularly, and the contributions from observational error and the effect of ground resistivity variations over the D/F site have been estimated. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

3519. BRAMLEY, E. N., "Some Aspects of Rapid Directional Fluctuations of Short Radio Waves Reflected at Ionosphere," Proc. IEE, vol. 102, Part B, no. 4, pp. 533-540, 550-554; July 1955. ABSTRACT: Measurements of fluctuations observed on single component first order ionospheric echoes, at vertical and oblique incidence (range 700 km), and on frequencies of 2.5-10.5 Mc; under quiet ionospheric conditions rms angular deviations are of order of 1° or less, but are much greater under ionospheric storm or spread-F conditions. (a-1, b-1, c-1, d-5, e-0, f-Experimental observations)

3520. BRAMLEY, E. N., "Some Comparative Directional Measurements on Short Radio Waves over Different Transmission Paths," Proc. IEE, Part B, vol. 102, pp. 544-549; July 1955. ABSTRACT: Observations on 1st and 2nd-order F-layer echoes from a pulsed transmitter at frequencies of 5-8 Mc/s have been made at two direction-finders separated by 213 km. From a comparison of first-order bearings over the two paths it has been found that negligible correlation exists between similar components of the random ionospheric tilts at points separated by 106 km. However, relatively small average tilts over a period of an hour have been found to occur, and these are correlated over wide areas; they show a regular diurnal variation. The mid-points of the two transmission paths lay on land and on sea respectively, and a comparison of the directional variations exhibited by the second-order echo showed that the land behaved as a rougher reflector than the sea. The resulting difference in the total variance of bearings on this echo for the two paths was, however, small, as the deviations were mainly caused by ionospheric tilts. (a-1, b-1, c-1, d-5, d-0, f-Measurements)

3521. SOMMERS, D. J., "Photoetched Antennas for Supersonic Aircraft," Electronics, vol. 28, pp. 130-133; July 1955. ABSTRACT: A three-plate shielded-strip transmission line, made up by photo-etching a center strip on the inside faces of two dielectric sheets each of which has copper foil bonded to both surfaces has a slot array etched in the outer face, thus providing a microwave antenna suitable for flush mounting in the skin of aircraft. (a-5, b-2, c-1, d-1, e-0, f-Description)

3522. MANNING, L. A., "A Survey of the Literature of the Ionosphere," Final Report, July 31, 1955. Prepared under Contract AF 19(604)-686 for Air Force Cambridge Research Center, Radio Propagation Laboratory, Stanford University, Stanford, California. ABSTRACT: Abstracts are presented of the principal published papers dealing with study of the ionosphere by radio methods; the period covered by the survey is roughly 1928 through 1954. Two systems of indexing are provided by means of which papers on given subjects can be found. A number of chapters are presented introducing and summarizing certain basic aspects of ionospheric research. Finally, recommendations are made pointing out further studies that should be undertaken. (a-1, b-3, c-1, d-1, e-0, f-Literature survey)

3523. TOOHIG, M. F., RUDNICK, P., AND ROBERTSON, K., "Iatron Tube Development for AN/ARD10(XA-1)," Farnsworth Electronics Company, Fort Wayne, Indiana, Quarterly Report, Contract No. AF 33(600)25523. See also ASTIA No. AD-68 831; 31 July 1955. ABSTRACT: Not available; for earlier report see Abstract 3503. (a-4, b-3, c-1, d-1, e-0, f-Progress report)

3524. WILCOX, C. H., "The Scattering of Electromagnetic Radiation by a Cylindrical Shell of Finite Length," Air Force Cambridge Research Center, Cambridge, Massachusetts; ASTIA No. AD-74759; August 1955. ABSTRACT: In this thesis a method is developed for estimating the strength of the electromagnetic radiation which is scattered by a perfectly conducting circularly cylindrical shell of finite length when it is irradiated by a plane electromagnetic wave. The problem of calculating the radiation scattered by a thin cylindrical shell or wire has been studied by a number of writers in the field of antenna theory. (A thin cylinder is one for which the ratio a/λ of cylinder radius to wave length is small compared with unity.) Hallén, in 1938, derived an integral equation for the current induced in the cylinder and gave an iterative procedure for estimating the solution. The equation is an approximate one, derived under the assumption that $a/\lambda \ll 1$. In nearly all the subsequent studies of the problem Hallén's equation is taken as a starting point. Several refinements of Hallén's method of solving the equation by successive approximations have been published. Van Vleck, Bloch, and Hamermesh in a paper published in 1947 derived approximations to the back scattering, or radar, cross section of a thin cylinder by two different methods. In both methods the current in the cylinder is assumed to consist of a sum of four trigonometric functions. (a-1, b-3, c-1, d-1, e-904, f-Thesis)

3525. LITTLE, C. G., "Radio Wave Propagation in the Arctic,"

Geophysical Institute of the University of Alaska, Interim Scientific Report No. 1, Contract No. AF 19(604)-1089; ASTIA No. AD-72903; 15 August 1955. ABSTRACT: The report is divided into six main sections. The first five deal in turn with the five main Tasks specified in the contract; the sixth describes three other phases of work also concerned with radio wave propagation in the Territory. The progress in these various fields is summarised very briefly below. 1. Sweep-frequency Ionospheric Back-Scatter: No progress was made on this task, owing to lack of equipment. 2. Auroral Radar Echoes: An SCR-270 radar was modified for auroral radar research, and two main investigations were carried out with this equipment. The first one was to determine the mode of propagation of VHF auroral echoes; the results showed conclusively that a strong aspect sensitivity exists, due to the auroral ionization being aligned along the lines of force of the earth's magnetic field. The second investigation was to determine the relationship between the radar echoes and the occurrence of visual aurora; these observations showed that the radar echoes are usually closely associated in range and azimuth with visual aurora, but that the visual brightness of the aurora is not the factor controlling the strengths of the echoes. No echoes were obtained at frequencies greater than 106 mc, owing to lack of suitable equipment. 3. Investigation of Microwave Link: The experimental observations carried out on this link showed the absence of significant tropospheric refraction effects, and the work has now been terminated. 4. Prediction of Auroral and Ionospheric Storms: The prediction of aurora and ionospheric storms presumes a thorough understanding of the phenomena. A brief review is given of the source of the disturbances, a stream of ionized particles from the sun, and the several influences which are observed during and subsequent to the bombardment of the atmosphere by these particles. Research in several phases of the problem which are in progress at the Institute are mentioned as well as that which is being done on this contract. The principle effort during the past year on this contract was development of some techniques for a better understanding of the aurora. These are the all-sky camera which is being used to study the development of an auroral display and the photoelectric photometer which appears to be useful in supplying data for an index of auroral activity. Some preliminary results from both of these equipments are presented. 5. Whistlers: Observations have shown the fairly frequent occurrence of whistlers at College during the early part of July 1955. Tape recordings of some of these whistlers are now being analysed to determine their frequency dispersion. 6. Additional Work: Three main phases of additional work, dealing respectively with the tropospheric propagation of VHF radio waves, the diffraction and scattering of VHF radio waves by mountains, and the absorption of HF radio waves of the ionosphere were carried out at the Geophysical Institute. Numbers one and three of these were conducted at the request of the Alaskan Command, U. S. Air Force; the second problem was investigated in view of its possible importance in point-to-point communication in the Territory. (a-1, b-3, c-1, d-1, e-905, f-Progress report)

3526. ANONYMOUS, "Informatory Test of Lear ADF-15A," Continental Army Command Board No. 6, Camp Rucker, Alabama, ASTIA No. AD-69 868; 16 August 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test)

3527. CRICHLOW, W. Q., SMITH, D. F., MORTON, R. N., AND CORLISS, W. R., "Worldwide Radio Noise Levels Expected in the Frequency Band 10 Kilocycles to 100 Megacycles," National Bureau of Standards, Circular 557; 25 August 1955. ABSTRACT: External radio noise levels are presented in the form of an effective antenna noise figure F_a, which is defined as the noise power available from an equivalent lossless antenna relative to kt_0b (the thermal noise power available from the passive resistance of a circuit with bandwidth, b, and at the standard absolute temperature, t_0). This form of expressing the noise has been chosen for convenience in combining for practical applications the noise received external to the antenna with the noise already present in the receiver. This form of presentation includes the frequency squared factor arising from the absorbing area of the receiving antenna and provides a measure of noise directly applicable to the "transmission-loss" method of measuring radio propagation. Curves are given that show the expected median levels of radio noise during 4-hour time blocks for each season. The curves also show the effects of frequency and geographical location (using noise grade maps) and include atmospheric, galactic, and manmade noise sources. The expected median values of atmospheric noise levels were largely based on the information given in the National Bureau of Standards Circular 462. Also, the expected variability of noise levels within the 4-hour time blocks is given in terms of the ratios of the upper decile to median level and median to lower decile level. These ratios are shown to be a function of frequency, time of day, and median noise-level amplitude. The results of measurements at Boulder, Colorado, Front Royal, Va., and Tatsfield, England, are shown in comparison with the expected levels. (a-1, b-3, c-1, d-1, e-329, f-Theory and measurements)

3528. BAILEY, A. E., "Equipment and Techniques for Sector-Type Radio Direction Finder Bearing Data Computing, Recording, and Reduction," Engineering Experiment Station, University of Illinois, Urbana, Illinois, Technical Report No. 22, Contract No. N6-ori-71, ASTIA No. AD-69594. See also Department of Commerce PB122982; 31 August 1955. ABSTRACT: A sector-type radio direction finder bearing computer-recorder, a bearing integrator, related equipments, and techniques are described. The computer samples the intermediate frequency outputs of a twin-channel RDF system at a 25 cps rate, calculates the indicated bearing for each sample via a logarithmic analog, and (sample for sample) delivers at the output a stretched pulse the amplitude of which is proportional to the bearing deviation from a preset reference zero. The recorded sequence of output pulses is a sampled-data presentation of the bearing deviation. The data may be recorded by any oscillographic recording system having adequate bandwidth. The effective linear azimuthal range of the computer is limited to a ±15° sector centered on reference zero. However, a bearing shifter is incorporated which, within limits, effectively shifts the apparent azimuth of the arriving signal into the linear range of the computer. Immediate statistical reduction of the sampled-bearing data is available by means of an electronic bearing integrator of the long time constant RC type. It is used to determine the cumulative mean of the sequence of indicated bearings over any period of integration which does not exceed three minutes. Additional significant statistical reductions can be obtained through the following electronic processes. A root-mean-square bearing deviation computer may be used for obtaining an estimate of the standard deviation, and a "least-squares" technique may be used in finding the best estimate of the mean when the equipment is used as an operational direction finder device. In order to make the computer-recorder amenable to practical and operational applications, circuits are proposed and described which will permit use of the computer on ABI type and rotating spaced-loop type radio direction finders. (a-1, b-3, c-1, d-1, e-327, f-Experimental results)

3529. ANONYMOUS, "IRE Standards on Radio Receivers: Method of Testing Receivers Employing Ferrite Core Loop Antennas, 1955," Proc. IRE, vol. 43, no. 9, pp. 1086-1088; September 1955. ABSTRACT: New Standard describing modification of existing techniques which allows for measurement of receiver employing ferrite core loop antennas; data prepared by IRE committees, designated Standard 55 IRE 17.S1. (a-5, b-1, c-1, d-1, e-407, f-Standards)

3530. BENOIT, JR. R. C., AND FURLOW, M. W., "Design for Wide-Aperture Direction Finders," Tele-Tech & Electronic Ind., vol. 14, pp. 60-62, pp. 104-108; September 1955. ABSTRACT: The antenna system of the USAF direction finder AN/GRD-9 is described. It is developed from the German Wullenweber uhf system and produces a pattern equivalent to that of a rotating planar array by means of a number of fixed elements arranged in a circle, with an inner circle of reflectors, the signals being picked up by a rotating commutator and appropriately delayed so that all arrive in phase at a common mixing point. For the experimental model described the frequency range covered is wider than 225-400 mc, the beam width being 6 degrees; bearings can be determined to within ± 1 degree. (a-3, b-2, c-1, d-1, e-4, f-Description)

3531. KUMMICH, R., "Night Effect in the Consol Navigation System," Fernmeldetech. Z., vol. 8, pp. 494-500; September 1955. ABSTRACT: It is shown that the combination of the ground wave with the sky wave causes deviation of all the beams except the main one; in some cases the rhythm of the signal is also disturbed. (a-3, b-2, c-4, d-4, e-0, f-Theory)

3532. RAWER, K., "Accuracy of the 'Sonne' (Consol) Navigation System," Fernmeldetech. Z., vol. 8, p. 510; September 1955. ABSTRACT: Brief note summarizing results of an unpublished 1944 report on an extensive series of observations. Night-time deviations and scatter of observations were consistent with present-day knowledge of ionospheric propagation. (a-3, b-2, c-4, d-4, e-0, f-Survey)

3533. ROESSLER, E., "Long-Range Radio Navigation in the Long-Wave Band," Fernmeldetech. Z., vol. 8, pp. 485-489; September 1955. ABSTRACT: The Navaglobe-Navaho system is discussed and compared with other systems in use, from the point of view of the number of ground stations required, the bandwidth requirements and the sensitiveness to noise. (a-3, b-2, c-4, d-4, e-0, f-Discussion and comparison)

3534. ZIEHM, G., "Explanation of Difficulties in Direction-Finding on Ships When Using Short or Intermediate Wavelengths," Frequenz., vol. 9, pp. 310-318; September 1955. ABSTRACT: A theoretical

investigation of the effect of metallic scatterers (e.g., funnels, cranes) on the accuracy of direction-finding apparatus. Errors may be reduced by (1) avoiding radio-frequencies in the region of the resonant frequency of the parasitic oscillators, (2) using an X-shaped aerial placed remote from the field of the metal, and (3) using magnetic circular aerials to avoid confusion as to the sense of bearing readings. These conclusions are based on the considerable experimental evidence quoted. (a-5, b-2, c-4, d-4, e-9, f-Study)

3535. BEEBE, W. E., "Flight Test of Direction Finder Group AN/ARA-25," Wright-Patterson Air Force Base, Ohio, WADC Technical Note No. 55-467; ASTIA No. AD-74321; 8 September 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

3536. PLONSEY, R., "Diffraction by Cylindrical Reflectors I," University of California, Berkeley, California: ASTIA No. AD-74695; 8 September 1955. ABSTRACT: It is first shown what simplifications in the rigorous theory are implied in the geometrical optics solution to the cylindrical reflecting antenna. Then, based on an assumed geometrical optics reflector current, a correction to the ray optics far field is obtained in terms of asymptotic expansions. These expansions are evaluated at the end points, as well as the stationary phase point. An analysis of the approximate region of usefulness of the asymptotic series is undertaken. As an example a diffraction integral arising from a pillbox feed-blocking problem is considered. (a-1, b-3, c-1, d-1, e-903, f-Theory)

3537. HARGENS, C. W., "An All-Electronic Signal-Seeking Broadcast Receiver," IRE Trans., vol. BTR-1, pp. 5-9; October 1955. See also Proc. IRE, vol. 44, p. 434; March 1956. ABSTRACT: This paper describes a practical signal-seeking receiver which requires no mechanical tuning mechanism. High-frequency saturable reactors are used in the tuning and oscillator circuits, and means for causing the receiver to lock on stations of specified signal strength are described. Several methods for producing tracking between the oscillator and tuning circuits are also discussed. The characteristics of the tuning inductors used are given as well as performance curves for the complete receiver. (a-3, b-1, c-1, d-1, e-624, f-Description)

3538. HERBSTREIT, J. W., AND THOMPSON, M. C., "Measurements of the Phase of Radio Waves Received over Transmission Paths with Electrical Lengths Varying as a Result of Atmospheric Turbulence," Proc. IRE, vol. 43, no. 10; October 1955. ABSTRACT: A system for the measurement of the variations in electrical lengths of radio propagation paths is described. The observed path-length instabilities are considered to be caused by the same atmospheric turbulence responsible for the existence of very high frequency and ultra high frequency fields far beyond the radio horizon. Results obtained on 172.8 mc and 1,046 mc along 3-1/2-, 10-, and 60-mile paths are reported. It is pointed out that measurements of this type provide a powerful tool for the study of the size and intensity of the refractivity variations of the atmosphere giving rise to the observed phenomenon. (a-1, b-1, c-1, d-1, e-922, f-Experimental analysis)

3539. NORWOOD, V. T., "Note on Method for Calculating, Coupling Coefficients of Elements in Antenna Arrays," Trans. IRE, vol. AP-3, no. 4, pp. 213-214; October 1955. ABSTRACT: Explicit expression for calculating coupling coefficients for each element of traveling wave array is derived: coupling coefficients are shown to be completely determined by desired current distribution across aperture, waveguide attenuation, and percentage of total power which is jettisoned into load. (a-3, b-1, c-1, d-1, e-0, f-Qualitative analysis)

3540. SOLLENBERGER, T. E., "Multipath Phase Errors in CW-FM Tracking Systems," IRE Trans., vol. AP-3, pp. 185-192; October 1955. ABSTRACT: Errors in missile-tracking systems due to reflections from the ground and from neighboring objects are discussed. Use of frequency modulation permits discrimination against the relatively weak interfering signals. The phase error can be reduced indefinitely by increasing the bandwidth used. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3541. ANONYMOUS, "Antenna-Direction Finding (for Submarine Use in Frequency Range 160-320 and 300-600 MCS) and a Unified DF Control System," General Electronic Laboratories, Incorporated, Cambridge, Massachusetts, Interim Report No. 9, Contract No. 63268; ASTIA No. AD-141 575; 3 October 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3542. ANDERSON, R. E., "A Doppler Direction Finder," Proc. NEC, vol. 11, p. 738; 3-5 October 1955. ABSTRACT: This paper describes the type AN/TRD-8 (XE-1) Direction-Finder which employs the Doppler principle to determine the direction of arrival of radio signals in the frequency range 0.8 to 15 megacycles. Signals received on a large-aperture circular array of antennas are sampled by a compact, rotating, capacitively coupled scanner. The action of the scanner introduces on the received signal a frequency modulation which has a modulation-envelope phase related to the direction of arrival. The FM phase is compared with a reference phase to produce a direct reading of the bearing on a cathode-ray tube. The use of FM and a large-aperture array result in improved accuracy over systems which are now generally used in this frequency range. (a-1, b-1, c-1, d-1, e-0, f-Description)

3543. BAILEY, A. E., AND SYDNOR, R. L., "A Radio Direction Finder Bearing Computer and Data Reduction Unit," Proc. NEC., vol. 11, p. 753; 3-5 October 1955. ABSTRACT: A sector-type radio direction finder bearing computer-recorder, a bearing integrator, related equipments, and techniques are described. The computer samples the intermediate frequency outputs of a twin-channel RDF system at a 25 cps rate, calculates the indicated bearing for each sample via a logarithmic analog, and (sample for sample) delivers at the output a stretched pulse the amplitude of which is proportional to the bearing deviation from a preset reference zero. The recorded sequence of output pulses is a sampled-data presentation of the bearing deviation. The data may be recorded by an oscillographic recording system having adequate bandwidth. The effective linear azimuthal range of the computer is limited to a ± 15° sector centered on reference zero. However, a bearing shifter is incorporated which, within limits, effectively shifts the apparent azimuth of the arriving signal into the linear range of the computer. The systematic error is less than 0.2 degree. Immediate statistical reduction of the sampled-bearing data is available by means of an electronic bearing integrator of the long time constant RC type. It is used to determine the cumulative mean of the sequence of indicated bearings over any period of integration which does not exceed three minutes. (a-1, b-1, c-1, d-1, e-0, f-Description)

3544. PRZEDPELSKI, A. B., "High Frequency Man-Pack Direction Finder," A.R.F. Products, Inc., 7627 Lake Street, River Forest, Illinois, Quarterly Report No. 1; Contract No. DA-36-039-sc-64707; ASTIA No. AD-77311; 15 October 1955. ABSTRACT: The main purpose of this contract is to develop a portable direction finder covering the frequency range of 500 KC to 20 MC. Transistors are to be used throughout if possible, to reduce size, weight, and power consumption. This particular report covers a general study of the requirements, and the completion of main circuit configurations. (a-1 and 4, b-3, c-1, d-1, e-899, f-Report)

3545. ANONYMOUS, "Interim Development Report on Close Grouping of Rhombic Antennas (No. 4)," Development Engineering Corporation, Leesburg, Virginia, ASTIA No. AD-83 224; November 1955. ABSTRACT: An empirical curve has been developed which relates the inter-antenna coupling magnitude of close spaced rhombics to the separation of the closest points of the antennas. The curve is valid over the normal frequency range of the antennas and for all orientations except the special case of antennas aligned on a common major axis. Impedance variations due to the proximity of adjacent rhombic antennas is shown to be negligible. (a-1, b-3, c-1, d-1, e-936, f-Progress report)

3546. THOMAS, J. A., AND MC NICOL, R. W. E., "Automatic Recording of the Direction of Arrival of Radio Waves Reflected from the Ionosphere," Proc. IEE, Part B, Vol. 102, pp. 793-799; November 1955. ABSTRACT: Equipment is described which, for a fixed frequency, simultaneously determines the direction of arrival of all resolved pulses reflected from the ionosphere by measuring the phase differences for two pairs of fixed orthogonal spaced-loop aerials. The vector sum and difference of the signals for each pair of loops in turn are formed in a special unit. These are amplified in normal receivers and the rectified video outputs applied to the Y- and X-plates respectively of a cathode-ray tube. The orientations of the resulting lines are thus governed by the phase differences between the signals at the pairs of loops. Pulse resolution is achieved by the simultaneous application of a time-base in the X-direction. Phase-balanced receivers are not required; since the phase-sensitive portion of the equipment is confined to the loops, pre-amplifiers and the sum-and-difference unit, the system is stable enough to run without attention for up to one week. (a-1, b-1, c-1, d-5, e-521, f-Description)

3547. ANDERSON, W.G., "An Application of Statistical Theory to the Accuracy Problem of the Visual Omni-Range System of Aircraft Navigation," Collins Radio Company, Cedar Rapids, Iowa, Report No. CTR - 149; 15 November 1955. ABSTRACT: This paper describes a statistical treatment of the errors encountered in the VHF Visual Omni-Range Navigation System. The first part of the paper consists of a rudimentary discussion of statistical theory which serves to acquaint the reader with the methods used in the second portion of the report. Each of ten different errors is described in terms of a normal distribution function with the parameters x̄ and s, the mean and standard deviation respectively. The ten errors are summed up and are compared to the error distribution which was obtained from error data gathered by the pilots of various scheduled airlines. The close agreement justifies the method used. Of the ten errors, only five are significant, and the VOR ground station error is shown to be greater than the sum of the other nine errors. (a 1, b-3, c-1, d-1, e-346, f-Description)

3548. BOLLJAHN, J.T., "ADF Sense Antenna Requirements and Design," Trans. IRE, vol. ANE-2, no. 4, pp. 23-30; December 1955. ABSTRACT: This paper describes the major results of a study undertaken by Stanford Research Institute for Aeronautical Radio, Inc. in order to assist in the preparation of ARINC Equipment Characteristic No. 530 which describes the technical features of a new automatic direction finder receiver of interest to the airline members of ARINC. The study was concerned primarily with sense antenna requirements and with the problem of selecting a standard sense input circuit to be specified in this Equipment Characteristic. The operational requirements for the new ADF receivers, insofar as the sense system performance is concerned, are the following: (a) the performance of the receiver as determined by its useful operating range must be at least as good as that realized with existing ADF receivers in airline service (the widely used Bendix MN-62 receiver is considered as a performance reference); (b) Longer sense cables than the 30-foot cable used with the MN-62 receiver are required to insure adequate over-station performance on the larger aircraft of the future. Although the phase control technique proposed by Ward for compensating the effects due to improper sense antenna placement appear to offer promise, it is felt that a provision should be made in the receiver design to permit location of the sense antenna for zero tilt angle, provided that this does not compromise some other aspect of the receiver performance. A cable length of 60 ft. was considered adequate for all foreseeable requirements; (c) A type of sense cable which is more rugged than the currently used low capacitance cable should be adopted, if feasible, to minimize the cable maintenance problem; (d) The input circuit configuration selected as a standard should be compatible with the trend toward flush mounted antennas. Furthermore, the sense antenna sensitivity requirements should be held to a minimum in order to minimize the size and weight of the antenna installation. Although the use of a preselector at the base of the antenna appears to offer promise as a means for reducing the antenna sensitivity requirement in a case such as this, where the antenna is to be located as much as 60 ft. away from the receiver input, preselectors were considered undesirable because of the potential difficult maintenance problem with tuned preselectors and because of the intermodulation problem with untuned preselectors. For these reasons, the study was devoted almost entirely to consideration of passive input systems and of certain aspects of antenna design. (a- , b-1, c-1, d-1, e-0, f-Description)

3549. CARNES, W. F., "Airline Requirements for Airborne Automatic Direction Finders and the Program of Equipment Development," Trans. IRE., vol. ANE-2, no. 4, pp. 12-16; December 1955. ABSTRACT: With the many complex electronic devices which are now standard on the modern airline aircraft, it may be hard to realize that just a little over a decade and a half ago, the airline industry was beginning what was considered to represent a milestone in electronic equipment installation in transport aircraft. The decision to install the automatic airborne radio direction finding equipment in airline fleets was met with somewhat less than great enthusiasm by the radio maintenance people in the airlines. Even the airline radio engineers were somewhat skeptical as to whether such a complicated electronic device as an automatic direction finder could ever be maintained to the degree necessary to provide the pilot with reliable automatic bearings. In those early days, the ADF was considered a luxury; it was stated that airline operation would be based on range flying techniques and supplemented by the manual direction finder, but that the ADF would only serve as a useful convenience to the pilot as he must always maintain complete proficiency in being able to solve any navigation problems with nothing more than a simple range receiver, either with or without manual D/F provisions. As time went by, the airline pilot decided he liked the ADF! In a very short time, even though there was still no "operational requirement" for the ADF in airline operation, dual ADFs began to appear on most of the nation's airline aircraft. The justification for the dual provisions was simply that the added convenience of an ADF was so great as to justify dual sets in the aircraft. As more time went by, some airlines found that certain route segments could be operated using D/F techniques where the desired route did not coincide with a leg of an LF range. They found that by using D/F techniques, they could fly a direct line between the two points rather than follow the more circuitous established airway routes. With more and more such off-airway routes being authorized, it began to be evident for the first time that there was an actual "operational requirement" for ADF, as the manual DF was too inconvenient and slow for use in a busy cockpit. Following the Second World War, the United States airlines found themselves with a considerable number of surplus military aircraft, many of which had been equipped with the military R-5/ARN-7 "radio compass." Soon a commercial version of the ADF came on the market, identified as the Bendix MN-62A and this became the almost universal standard for airline use. Although the Military moved toward adopting the newer ARN-6 ADF as their standard, the airlines did not look with as much favor on the new unit for their operation and preferred to remain with the commercial model MN-62. By this time, an extensive program was under way to obtain airline VOR receivers, and the general feeling seemed to be that the low frequency ADF was obsolescent and the emphasis should be placed on VHF navigation aids. The RTCA SC-31 Common System program strongly emphasized VHF navigation aids, and implied an early obsolescence of low frequency facilities, except for very limited and special uses. In 1950, the Air Coordinating Committee, Air Traffic Control and Navigation Panel's report, "Air Traffic Control and The National Security," emphasized the role of VHF navigation aids for enroute use. The report hardly even mentioned the low frequency aids and the part they might play in any future planning. With the tremendous expenditures being made by the Government to implement a VHF airway system in the U.S., Congressional pressure began to mount for doing away with the low frequency facilities rather than maintaining, at Federal expense, a dual system of short range navigation aids. The net effect of this emphasis on VHF facilities discouraged any extensive interest on the part of the user, or any work on the part of the manufacturer which might have spurred the development of better ADF equipment. Except for several short-lived flurries of activity on the part of some equipment manufacturers, there seemed to be no interest during this period in developing a modern airborne radio direction finder for airline use to replace the bulky and heavy Bendix MN-62. (a-1, b-1, c-1, d-1, e-0, f-Survey and description)

3550. HEMPHILL, A.A., "A Magnetic Radio Compass Antenna Having Zero Drag," Trans. IRE., vol. ANE-2, no. 4, pp. 17-22; December 1955. ABSTRACT: The use of high speed aircraft has accentuated the requirements for low drag antennas and has made the precipitation static problem much more severe. A radically new loop design using ferrite materials makes it possible to exceed the performance of the present external loop antenna in a submerged magnetic antenna that has zero drag. Among its important characteristics are lower weight, less mechanism, and rejection of precipitation static interference as well as reduction of the drag to zero. The antenna consists of a small ferrite-core goniometer with four radial collector bars of the same materials. The design includes a novel quadrantal error compensating scheme in which the loop is compensated by attaching selected end pieces to the collector bars. (a-1, b-1, c-1, d-1, e-0, f-Description)

3551. KAHAN, T., "On the Electrodynamics of Turbulent Ionized Media," Comptes Rendus, vol. 241, no. 24, pp. 1726-1727; December 1955. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-Propagation theory)

3552. MOSELEY, F.L., "The Automatic Radio Direction Finder," Trans. IRE., vol. ANE-2, no. 4, pp. 8-11; December 1955. ABSTRACT: The convenience, ease of operation and inherent reasonableness of a direction finding system which culminates in a simple needle pointing to the selected radio station must make it seem to the late-comer that things were always thus in the plane's front office. Not so. Much anguish was experienced, many brains overtaxed, and considerable ingenuity exercised to place this apparently simple device in the hands of the pilot. It will be the purpose of this paper to give the history of the development of the Automatic Direction Finder, to give a condensed explanation of its mode of operation, and to describe its use in the navigation of aircraft. (a-1, b-1, c-1, d-1, e-763, f-Survey and description)

3553. MULLIN, L.R., "The Marconi AD.7092 Series of ADF Receivers," Trans. IRE., vol. ANE-2, no. 4, p. 42; December 1955. ABSTRACT: This paper traces briefly the history of the development of the AD.7092 series of automatic radio direction finders and describes the special features of the AD.7092C which was designed to suit the requirements of North American operators. Novel features include an electrical remote control system and a tuned remote sense

amplifier which permits the use of long feeders using small sense antennas. The suppressed loop antenna and method of error compensation are described and the trend of future ADF developments in Great Britain is indicated. (a-1, b-1, c-1, d-1, e-0, f-Historical survey)

3554. PRZEDPELSKI, A. B., "High Frequency Man-Pack Direction Finder," A.R.F. Products, Inc., River Forest, Illinois, Quarterly Report No. 2, Contract No. DA-36-039-sc-64707, ASTIA No. AD-85 691; December 1955. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3544)

3555. ROY, R., AND VERMA, J.K.D., "Polarization of Electromagnetic Waves for Vertical Propagation in the Ionosphere," J. Geophys. Res., vol. 60, no. 4, p. 467; December 1955. ABSTRACT: A theoretical study of the variation of the state of polarization of a vertically incident electromagnetic wave while in propagation in the ionosphere has been made on the basis of an approximate solution of the wave equations obtained by Saha, Banerjee, and Guha. It has been shown that the major axes of the polarization ellipses of both the ordinary and the extraordinary waves would lie in the N-E quadrant in the northern hemisphere and in the N-W quadrant in the southern hemisphere. A new method has been outlined for the determination of the electron density and the collision frequency in the ionised layers from the value of the tilt-angle and the ratio of axes of the elliptic patterns. An analysis of the characteristics of the experimentally observed polarization patterns indicates that in E layer the value of ν is 1.7×10^6 per second. They further show that the polarization of the downcoming waves corresponds to their respective reflection levels, rather than a limiting region below the E layer. (a-4, b-1, c-1, d-1, e-0, f-Study)

3556. STANNER, W., "The Phenomenon of Pulsation in Direction Finding," Elektron. Rundschau., vol. 9, no. 12, pp. 426-428; December 1955. ABSTRACT: It is possible in principle to deduce the direction of a source of spherical waves by comparing the amplitudes induced in two aerials fixed together so as to be mutually perpendicular. When the source emits pulses of radiation, as with the Consol system of navigation, the apparent direction of the source varies in time with the pulses. It is suggested that this is due to secondary radiation from other objects. (a-2, b-2, c-4, d-4, e-0, f-Theory)

3557. WARD, H.H., "Analysis of Over-Station Behavior of Aircraft Low Frequency ADF Systems," Trans. IRE, vol. ANE-2, no. 4, pp. 31-42; December 1955. ABSTRACT: A theoretical investigation has been made of the behavior of low-frequency automatic direction finder systems in aircraft on courses near and over the radio station. This behavior is explained in the light of electromagnetic field theory and the equipment characteristics. An equation is derived for the locus of all points where the ADF indicator will start to reverse due to sense-antenna signal phase shift with respect to the loop-antenna signal as the station axis is approached and passed. The equation contains six geometrical and electrical variables. The locus thus defined is similar to a cone or paraboloid, apex down, with the apex located at the radio station in most cases. The equation predicts that for a phase advance of the loop signal, relative to the sense-antenna signal, of slightly more than the 90° value applied by the basic ideal receiver, the apex of the cone-like space figure locus rises off the ground, and that it would be possible to fly under this apex, producing but one reversal of ADF indicator needle with this single reversal starting exactly over the radio station. The altitude of this apex is a relatively simple function of the variables. The results of the flight tests verifying the theoretical findings are given together with some requisites for the use of the findings to eliminate the effects due to improper sense antenna location, provided the location error is not too extreme. (a-1, b-1, c-1, d-1, e-0, f-Study)

3558. ZIEHM, G., "Ferrite Aerials for Goniometer Direction Finders," Telefunken Zeitung, vol. 28, pp. 227-234, 265; December 1955. ABSTRACT NO. 1: A discussion of the design of D/F antennas for aircraft. The numerical calculations refer to a frequency of 300 kc and a magnetic field strength of 0.15 A/m. Arrangements of parallel rods offer advantages. ABSTRACT NO. 2: Two different methods of operation are first distinguished: resonant and aperiodic. In the resonant case, the ferrite should be chosen so that the product of effective permeability and frame Q-factor is a maximum. With aperiodic working the ferrite loss plays little part and the highest possible permeability is required. It is shown that because noise is present in any practical system the significant measure of bearing sensitivity is the minimum angle through which the frame must be turned to give a detectable change in output. For a particular system the quoted value of this change is 1/4 of noise level. The minimum angle is inversely proportional to the effective area of the frame and formulae are given for determining this. The properties of thin cylinders of ferrite are investigated and numerous graphs show the influence of length, thickness, permeability and winding technique. Methods are shown of combining several pieces of ferrite into a frame. (a_1-3, a_2-5, b-2, c-4 and 1, d-4, e-816, f-Analysis)

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3559. BARBER, N. F., "A Correlation Treatment of Fading Signals," J. atmos. terrest. Phys., vol. 8, no. 6, pp. 318-330; June 1956. ABSTRACT: The fading signals observed at spaced receivers are examined in terms of the complete correlogram. Two practical examples are discussed. (a-1, b-1, c-1, d-5, e-0, f-Discussion)

3560. BOWHILL, S. A., "The Fading of Radio Waves of Frequencies between 16 and 2400 kc/s," J. atmos. terrest. Phys., vol. 8, no. 3, pp. 129-145; March 1956. ABSTRACT: The lowest ionosphere, which reflects low-frequency radio waves, contains irregularities of ionization which cause fading of these frequencies. The irregularities have been studied by three types of experiment, all of them using cw transmissions reflected from the ionosphere at nearly vertical incidence during the night-time. Firstly, fading records over the frequency range 16-200 kc/s show shallow fading, with a substantially constant quasi-period of 7 minutes up to 70 kc/s; above this frequency a rapid fading of quasi-period about 1 minute appears as well, increasing in depth till it dominates the slower fading. Secondly, two receivers tuned to 85 kc/s separated by various distances give fading records whose statistical correlations lead to structure sizes at the ground of 5 km for the slow fading and 1 km for the fast fading. Thirdly, records taken at three receivers at right angles at 70 kc/s show that the slow fading is due mainly to random velocities of about 40 metres/sec at the reflecting layer, together with a smaller drift velocity which is very variable. These results lead to a suggested model, with small irregularities slightly above the 70 kc/s reflection level, together with large irregularities below this level. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

3561. BOWSER, R. W., AND BOBBETT, D. L., "Direction Finder Set AN/ARD-10 (XY - 1)," Farnsworth Electronics Company, Fort Wayne, Indiana, Final Engineering Report, Contract No. AF 33(600)-25523, ASTIA No. AD 141 277; 1956. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3562. DIEMINGER, W., AND MOLLER, H. G., "Echo Sounding Experiments with Variable Frequency at Oblique Incidence," Venice: Proceedings of the International Convention on Radio Propagation in the Ionosphere, Nachrichtentech Z., (NTZ) vol. 8, no. 11, pp. 578-586; November 1955. See also Nuevo Cimento, vol. 9 Supl., no. 4, ser. 10, pp. 1532-1545; 1956. ABSTRACT: The problem of synchronization of the transmitter and receiver of oblique-incidence echo-sounding equipment is discussed in detail. Block diagrams are given of suitable variable-frequency transmitting and receiving equipment. In both cases quartz-clock equipment is used for timing and control. A block diagram shows the arrangement of this equipment, a detailed description being given of its operation and of the simple means adopted for coordinating the two clocks, the frequency accuracy of which is to 1 part in 10^8. During the period 1950-1954, investigations were carried out with this equipment between Lindau (transmitter) and Düsseldorf, Hamburg, Darmstadt, Weissenau near Ravensburg and Keimola near Helsinki (receivers). Typical records are reproduced and comparison made with vertical-incidence records obtained at the same time, in one case at the transmitting station and in another case at about the mid-point of an oblique-incidence transmission path. The determination of the vertical-incidence echo height from the oblique-incidence records is discussed. The particular usefulness of the oblique-incidence method for exhibiting such effects as the decrease of the muf during the night, or for investigating sporadic-E effects, is considered, typical records being shown. (a-3, b-1, c-9 and 4, d-9 and 4, e-0, f-Study and experiment)

3563. ELLIS, G. R. A., "On the Propagation of Radio Waves through the Upper Ionosphere," J. atmos. terrest. Phys., vol. 9, no. 1, pp. 51-55; 1956. ABSTRACT: The low-frequency limit for the propagation of radio waves through the ionosphere is discussed. It is shown that reflection and absorption of extraordinary waves can occur well above the F region near the level where $f = f_H$, if the wave frequency is less than $f_H F_2$, and if the electron density near this level is not negligible. In these circumstances the low-frequency limit will be determined by $f_0 F_2$, and observations of cosmic radio emission at frequencies much below 1 Mc/s are unlikely. (a-1, b-1, c-1, d-1, e-0, f-Study)

3564. HARANG, L., AND PEDERSEN, K., "Drift Measurement of

the E-Layer," Geofys. Publ., vol. 19, no. 10; 1956. ABSTRACT: Not available. (a-4, b-1, c-21, d-21, e-0, f-Study)

3565. HARKIN, B., "The Expected Error of a Least-Squares Solution of Location from Direction Finding Equipment," Austr. J. Phys., vol. 7, p. 263; 1956. ABSTRACT: Formulae are derived for the error variances and covariances of the coordinate components of an unweighted least-squares solution for the location of a missile simultaneously reported by a number of optical or electronic direction-finding stations. Practical applications of the formulae are suggested. (a-1, b-1, c-1, d-11, e-0, f-Mathematical analysis)

3566. HINES, C. O., "Electron Resonance in Ionospheric Waves," J. atmos. terrest. Phys., vol. 9, no. 1, pp. 56-70; 1956. ABSTRACT: Large-scale travelling disturbances, now frequently observed in the ionospheric F layer, are interpreted in terms of an electron resonance. This phenomenon arises when an initial atmospheric disturbance sets the electrons into natural modes of oscillation, and the resultant increase of electron displacements then enhances the likelihood of detection by present (radio) techniques. Certain qualitative features of the observed disburbances can be explained on this basis, and a quantitative comparison provides estimates for several ionospheric parameters which are in good agreement with the values expected. Further application of an improved theoretical development may well provide an extremely useful method of investigating the physical properties of the ionosphere. (a-1, b-1, c-1, d-5, e-0, f-Study)

3567. KAHAN, T., "Ionospheric Turbulence and the Propagation of Electromagnetic Waves," Nuovo Cimento Suppl. (Ser. 10), vol. 4, no. 4, pp. 1352-1358; 1956. ABSTRACT: Not available. (a-4, b-1, c-3, d-9, e-0, f-0)

3568. KING, R. W. P., The Theory of Linear Antennas, with Charts and Tables for Practical Applications, Cambridge, Massachusetts, Harvard University Press; 1956. ABSTRACT: Chapter 7 of this book contains a brief description of a method which may be used to calculate the approximate field of a Beverage antenna. (a-4, b-6, c-1, d-1, e-0, f-Reference book)

3569. KOUYOUMJIAN, R. G., "Back-Scattering from Circular Loop," Applied Sci. Research, Sec. B, vol. 6, no. 3, pp. 165-179; 1956. ABSTRACT: Use of variational method to determine echo area of perfectly conducting, thin, circular loop; feature of problem is that for broadside aspect, current distribution can be determined exactly within limits of approximations made for thin wires; it appears that approximations for straight wire radiators may be extended to curved wires; comparisons between echo area values of loop and those of circular plate, sphere, etc. (a-3, b-1, c-1, d-1, e-0, f-See Abstract No. 3642.)

3570. MENZEL, D. H., WOLBACH, J. G., AND GLAZER, H., Solar Eclipses and the Ionosphere, (London), Pergamon Press; 1956. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-Ionospheric study)

3571. MIYAM, K., AND KANAYA, S., "On the Lateral Deviation of Radio Waves Coming from Europe," Rep. Ionosphere Res., Japan vol. 10, no. 1, pp. 1-8; 1956. ABSTRACT: Not available. (a-4, b-1, c-8, d-6, e-0, f-Study)

3572. MORISON, S. E., The Atlantic Battle Won, May 1943-May 1945, History of United States Naval Operations in World War II, Volume X, Little, Brown and Company, Boston; 1956. ABSTRACT: Volume X of a 15-volume set of books on the Naval history of World War II. This work contains a large number of incident descriptions in which high frequency direction finders were used in the Battle of the Atlantic. References to high frequency direction finding for both shipboard and shore are found on pages 20, 53, 54, 58, 68, 77, 115, 119, 124, 139, 143, 144, 152, 173, 187, 195 and 210. The various references are concerned with the extension of the high frequency direction finder network of shore stations, development of a shipboard HF/DF system and fixes obtained on U-boats communicating with German installations. A number of examples where U-boats were sunk as a result of accurate D/F fixes are described. The Tenth Fleet is referred to on page 115. An example of a false fix is mentioned on page 187. (a-4, b-6, c-1, d-1, e-0, f-Excerpted data pertaining to D/F)

3573. RATCLIFFE, J. A., "Some Aspects of Diffraction Theory--and the Application to the Ionosphere," Rep. Progr. Phys., vol. 19, p. 188; 1956. ABSTRACT: In Part I the 'Fourier' approach to diffraction theory is outlined in such a way as to emphasize its physical significance. Particular attention is paid to diffraction phenomena of the Fresnel type, and to diffraction from screens which alter both the phase and the amplitude of the incident wave. The 'Fourier' approach is extended to deal with problems of 'random' diffraction, for which purpose the use of auto-correlation functions is introduced and explained in physical terms. In Part II measurements made on radio waves reflected from, or transmitted through, the ionosphere are discussed. The nature of the radio diffraction pattern observed at the ground is first summarized and deductions are then made about the ionosphere which has given rise to this diffraction. There are few references in the text, but the bibliography provides brief abstracts of the more important papers on the subject. (a-1, b-1, c-1, d-1, e-0, f-Mathematical analysis)

3574. RUMSEY, V. H., AND WEEKS, W. L., "Electrically Small, Ferrite-Loaded Loop Antennas," IRE Convention Record, vol. 4, Part 1, pp. 165-170; 1956. ABSTRACT: Approximate formulas have been developed for the impedance, efficiency, and Q of electrically small, ferrite-loaded loop antennas. The formulas are based on an assumed knowledge of these parameters for the antenna without ferrite loading. One set of formulas based on an assumed internal magnetic field is primarily applicable to ellipsoidal-shaped cores; another set based on assumed internal and external fields is primarily applicable to rod-shaped cores. The formulas are derived using the reaction concept. Results are used to evaluate the effect of ferrite size and shape. (a-5, b-1, c-1, d-1, e-0, f-Mathematical analysis)

3575. SHCHEGOLEV, Y. Y., "Data on the Use of Sector Radio-Range Beacons and the Characteristics of Operation," Radioteknicheskiye Sredstva Morskogo Sudovozhdeniya, Moscow, Chapter 21, pp. 292-313; 1956. U S. Naval Oceanographic Office Translation No. TRANS-247. See also ASTIA No. AD-624 200. ABSTRACT: The characteristics of electromagnetic field in the area near the radio-range beacon are analysed, pointing out the audibility zones. Thus, the degree of accuracy in determining the bearings of the beacons is increased. A comparison among various radio-range beacons (Stavanger, Ploneis, Bushmills) shows the variations of accuracy when determining a ship's location in various sectors and the means of improving the accuracy. The development of the improved consolan type of sector radio-range beacons, which was discussed at the International conference on ocean navigation in 1954-1955, is also outlined. (a-3, b-6, c-2, d-2, e-0, f-Translation)

3576. SKEIB, G., "Locating Atmospheric Disturbances by Synchronous Recording of Direction and Waveform," Ber. Dtsch Wetterdienstes, vol. 4, pp. 146-147; 1956. ABSTRACT: Note of equipment which has been operating in Potsdam since 1953. It comprises a cathode-ray direction finder of the type described by Adcock and Clarke and an atmospherics waveform recorder used in an investigation by Schindelhauer, et al. Outputs from these two instruments are applied to a two-beam pulsed oscillograph displaying direction and waveform simultaneously. (a-3, b-1, c-4, d-4, e-0, f-Description)

3577. TERRETT, D., "The Signal Corps: The Emergency, (To December 1941)," United States Army in World War II, Office of the Chief of Military History, Department of the Army, Washington, D. C.; 1956. ABSTRACT: This book makes several important references to Signal Corp radio direction finding activity in the period immediately preceding World War II. Investigation of aircraft D/F systems as early as World War I is mentioned. Additional references are given. Meteorological direction finding is briefly mentioned. Tactical radio direction finding in the same early period is mentioned. Early variations in nomenclature such as radio location, RDF, radio direction finding and RPF or radio position finding are described. Early references to radar are mentioned including the mention as early as 1900 of Nikola Tesla of electromagnetic reflection and the prediction that moving object detection would follow. The growth of navigation radio out of World War I direction finding is mentioned with respect to both cooperative and noncooperative applications. Several SCR nomenclatures are mentioned including SCR-240, SCR-261, SCR-522, SCR-274-N, SCR-186 and SCR-242. (a-4, b-6, c-1, d-1, e-858, f-Historical Account)

3578. WHALE, H. A., "An Estimate of the Size of the Antipodal Area in Short-Wave Radio Propagation," J. atmos. terrest. Phys., vol. 9, pp. 159-161; 1956. ABSTRACT: In a recent series of experiments, the elevation angles and bearing angles of pulses (at

14,975 kc/s) transmitted from Slough (about 51° 30'N, 40'W) were measured at Seagrove, Auckland (about 37° 10' S, 174°20' E). The measurements, which were made on the rotating interferometer (Whale, 1954), extended from 24 October till 11 November 1955 and covered the period 0800-1600 GMT. The pulses were sent alternately on two different aerials, viz. a rhombic aerial oriented 30° east of north and a relatively nondirectional horizontal dipole. (a-1, b-1, c-1, d-1, e-0, f-Experimental analysis)

3579. WHALE, H. A., "Effective Tilts of the Ionosphere at Places about 1000 km Apart," Proc. Phys. Soc., vol. 69, no. 3, p. 301; 1956. ABSTRACT: A comparison of the bearing and elevation angles of radio waves from two stations situated about 2000 km to the North and to the West of the receiving site yields results which are sometimes consistent with the existence during the daytime of effective ionospheric tilts which are similar at places more than 1000 km apart. These tilts are of the order of half a degree and are in opposite directions during the morning and the afternoon. They may correspond to actual tilts of a uniform ionosphere or be due to horizontal gradients of electron density. The factor relating the tilt angle to the observed bearing deviations was measured experimentally and the effective tilt angle found to be approximately twice the bearing deviation. (a-1, b-1, c-1, d-5, e-0, f-Study)

3580. BAIN, W. C., "Adcock Direction Finder," Wireless Engr., vol. 33, pp. 20-24; January 1956. ABSTRACT: It was found that the pull of the triactics (supporting the central sense antenna) on the main antennas of an Adcock hf direction finder caused the main antennas to bend inwards, so that a large polarization error was produced on frequencies near 20 mc. Theoretical calculations are made for the case of antennas with an over-all slope of 1 degree, with a distant loop transmitter at 6.3 degrees elevation and with a loop tilt of 6 degrees from the horizontal: the total polarization error found is 6 degrees for a perfectly-reflecting ground and 19 degrees for ground of conductivity 0.02 mho/m. In practical direction finding the errors are not likely to be as high as this on the average; but the figure of 3 degrees is obtained for the root-mean-square error from a transmitter on 20 mc at 20 degrees elevation despite the small amount of antenna bending assumed. (a-1, b-2, c-1, d-5, e-0, f-Description)

3581. BAIN W. C., "The Theoretical Design of Direction-Finding Systems for High Frequencies," Proc. IEE, Part B, vol. 103, pp. 113-119; January 1956. ABSTRACT: The problem of finding the bearing of a distant hf transmitter in conditions of wave interference is examined for the simplified case of noninteracting antennas on a plane earth and with no pick-up of horizontally polarized radiation. Two methods of approach are considered - solution of the field equations for a number of incident plane waves from a knowledge of the field at the antennas, and the fitting of rectilinear constant-phase lines to observed values by a least squares process. It is shown that the cyclical system of Earp and Godfrey is a least squares system of the latter type. Systems of the Wullenweber kind bear a close resemblance to a least-squares system with weighting according to the signal amplitude at each antenna; the difference lies in the fact that they operate with sinusoidal functions of phase instead of linear functions. (a-1, b-1, c-1, d-5, e-0, f-Theory)

3582. TRAVERS, D. N., "Interim Development Report for Direction-Finder, Radio, Shipboard, Siting and Design, Study and Development," Southwest Research Institute, Interim Report No. 4, Contract NObsr 64585; 26 January 1956. ABSTRACT: This report serves a two-fold purpose. It fulfills the primary objective of presenting the engineering evidence of the past quarter, and summarizes the work performed during the first year of this contract. One year ago, the engineering activity under this contract could not be specifically stated in view of the broad nature of the problem. Today, the degree of emphasis necessary to balance the various phases of this project in their correct ratios of importance has been determined. Under the Conclusions, a section of this report has been prepared to show as concisely as possibly what has been achieved during the year on each of the project phases. The section is arranged for specific reference to each of the five phases given under the heading of Purpose. The engineering activity during the past quarter mainly has been directed toward the construction of the automatic plotter circuits and their testing. The Automatic Observed Bearing circuit has been completed for the DAU equipment and field tests performed. These tests, made on 26 January 1956, showed that one degree accuarcy readily is obtained even under conditions of extreme reradiation error and blurring. Results of the test are given. Additional synchro circuits to present the data to the recorders are now under construction. For complete versatility, the equipment will be adaptable to either the DAQ or SRD-7, to Manual or Automatic Observed Bearing, either rectangular or polar recording, and at either local or remote locations. It is reported that the completed plotting equipment can be ready for demonstration away from San Antonio by September 1956. The design work on the spaced loop antenna has been extended. A method of sense indication using a third loop has been evolved and is shown to be applicable to a cathode ray tube-type display. Construction difficulties are detailed and a design for a demonstration model using printed circuits on precision glass forms for the antenna loops is proposed. The construction tolerances involved have been calculated and are found to be well within possible limits for an antenna of SRD-7 dimensions. A new analysis of the bearing accuracy of this three-loop array has been made, and it is shown that potentially, it has a much greater accuracy than does either a simple loop, such as the DAU or SRD-7, or a spaced loop. It is shown that the increased accuracy is a result of reradiation suppression by proper null placement in the antenna pattern. Furthermore, it is shown that null position control is easily attained and that the conditions for maximum accuracy, minimum blurring, and definite sense indication exist simultaneously. A reradiation analysis with specific reference to theoretical and actual calibration curves has been prepared and is given for three antenna types. The reasons for each calibration curve cahracteristic are analyzed, and preventative measures to reduce undesirable effects are given for each antenna type. The conformal elliptical antenna work of the quarter has consisted entirely of the preparation of instrumentation in the form of rf balance to unbalance transformers. The quality of these transformers is discussed and the future progress of the program is mentioned. In connection with the reradiation work, tests have been made to determine the minimum radius of calibration which can be used in order to eliminate the chance of error as a function of radius. It is shown that this is related to the D/F to reradiator separation distance. The preliminary results of the test are given. Comparison of the DAU and SRD-7 systems is now well into the second phase. The DAU work has been completed and SRD-7 testing is now underway. Reradiation tests with a portable reradiator of variable location and height have been included. Miscellaneous activities of the quarter are mentioned. Of particular interest are the efforts to obtain helicopters for use in connection with project Phase III. Included in this report are six appendixes. Primarily, these are the mathematical justifications for certain important statements made in the text of the report. Separate symbol definitions are given. In addition, a complete set of calibration curves for the U.S.S. Bache with both DAU (made 18-19 March 1953) and SRD-7 (made 15 December 1955) antennas are given with photographs of the view seen by the D/F antenna in two directions. These curves are analyzed in the reradiation analysis section of the report. In addition, the recent calibration curves obtained in Norfolk at the calibration of a PT Boat with an SRD-7 installed are given and discussed. (a-1, b-3, c-1, d-1, e-1000, f-Interim report)

3583. BAIN, W. C., "Possible Errors of a Particular Wide-Aperture Direction-Finder," Proc. IEE, Monogr. no. 170 R; February 1956. ABSTRACT: A study is made of the extent to which the high-frequency cyclical direction-finder devised by Earp and Godfrey is subject to three common types of error. First, the result is presented of theoretical computations on the errors given by a practical fixed-aerial system in wave-interference conditions. The variance of these errors as the phase difference between the incident rays is varied is shown to be the same as that given by the ideal rotating-aerial version of this direction-finder; it is appreciably smaller than that of an Adcock for a system aperture of 4 λ, and, in general, much smaller for an aperture of 10λ. Secondly, errors due to aerial interaction are considered for a system of 24 unipoles, 9 m high and 1.1 mm in diameter, placed on a circle of 100 m diameter. It is concluded that the errors in indicated bearing are likely to be negligible, provided that the aerials not in use at any instant are terminated by a resistance equal to their nominal characteristic impedance. Finally, the polarization error is examined for such a system in which surface feeders are used, without an earth mat, on ground of moderate conductivity; it is found to be small, being greatest at the l.f. end of the band, where the standard-wave error is about 1° at 3 Mc/s. With extended feeders the l.f errors are reduced considerably. (a-2, b-1, c-1, d-5, e-0, f-Study)

3584. WILKINS, A. F., AND MINNIS, C. M., "Arrival Angle of H. F. Waves," Wireless Engineer, vol. 33, no. 2, p. 47; February 1956. ABSTRACT: Apparatus is described for measuring the angle of elevation of hf waves arriving at the ground after transmission by way of the ionosphere. The system involves the comparison of the amplitudes of the signals received by two vertically-spaced horizontal loop aerials at heights above the ground of about 33 metres and 12.5 metres. The comparison is effected by amplifying the signal emfs in a twin-channel receiver and applying the i.f. voltages to the deflecting plates of a cathode-ray oscilloscope. It is shown that, if a single ray is incident on the system, the emfs produced in the two aerials are in phase irrespective of their height above ground, so that the corresponding oscilloscope pattern is a straight line, the slope of

which is a simple function of the angle of elevation of the ray. Calibrations of the system over the band 10-20 Mc/s have shown that its behaviour is very close to that expected from the simple theory and that there is no noteworthy change in the calibration with azimuth. Methods of observation for the general case of the arriving signal consisting of more than one ray are considered. (a-1, b-2, c-1, d-5, e-0, f-Description)

3585. OMERA, T. R., "A Phase and Gain Matched Three-Channel Intermediate-Frequency Amplifier," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 23, Contract No. N6-ori-71 Task XV, ASTIA No. AD-86 560; 15 February 1956. ABSTRACT: A three-channel IF amplifier, which is matched in gain and phase, is described. This amplifier is designed for use with the matched three-channel RF amplifier described in Technical Report No. 18 to form a receiver for use at the University of Illinois RDF Field Station. Some of the features described are: (1) a staggered triplet section with 10 kc bandwidth for use in receiving 100 micro-second pulses, (2) large tuning capacitances to reduce detuning effects due to small capacitance changes, (3) a miniature relay band switching scheme, (4) resin potted coils, (5) gain trim and disable switches, (6) output amplifiers at video frequencies, and (7) AOG circuits. Several design problems encountered are discussed. Data is given on several of the subcircuits of the amplifier. (a-1, b-3, c-1, d-1, e-912, f-Description. See Abstract No. 3405)

3586. BUCHHOLZ, L., "Tuning-Conditions and Maximum Sensitivity of Bellini-Tosi Radio Direction Finders," Elektrotek. T., vol. 69, no. 5, pp. 49-54; 15 February 1956. ABSTRACT: Resonance conditions are calculated and the effect of the cable to the goniometer determined. Compensation for frame differences on shipboard by reduced diameter and/or number of turns in the fore and aft coil with added inductance is analysed. The design of the input transformer is treated and an example of aerial gain computed. (a-2, b-2, c-21, d-21, e-0, f-Analysis)

3587. ANONYMOUS, "New Commutated Antenna Direction Finder," Brit. Commun. and Electronics, vol. 3, no. 3, pp. 134-136; March 1956. ABSTRACT: Twelve omnidirectional aerials are arranged in a circle. Each in turn can be connected to a receiver through a diode switch so that the phase of the signal received can be compared with the signal from a subsidiary aerial. With this system site errors are small. The principle can be applied to HF, VHF and UHF bands. Further details have been published. (a-2, b-2, c-1, d-5, e-0, f-Description)

3588. BENOIT, R. C. AND FANTONI, J. A., "USAF UHF Direction Finding Facility," Convention Record of the IRE, March 1956. ABSTRACT: A description is given of the theory of operation, development, physical and electrical description, and performance of Radio Direction Finder AN/CRD-6. The equipment is a UHF ground based direction finding facility that was designed to fill USAF requirements in the frequency range of 225 to 400 mc/s for operation in conjunction with radio signals that emanate from high performance type aircraft. The equipment provides automatic, essentially instantaneous bearing information on any one of 10 preset channels of 1750 frequencies within its frequency range and is capable of complete remote operation from a distance of five miles or less over a four wire telephone cable. Its average bearing accuracy is of the order of ± 1-1/4 degree; its usable bearing sensitivity is 1 to 2.5 microvolts per meter over its frequency range. The antenna system differs considerable from conventional concepts formerly employed in the field of radio direction finding. A height diversity system, consisting of two individual identical antennas in conjunction with a comparator which automatically selects the proper antenna, is employed to minimize the effects of multipath propagation. The single antenna system covers the entire 225 to 400 mc/s range. Each individual antenna consists of a stationary dipole around which a reflector rotates at 1800 rpm, this modulates the received signal at 30 cps. A reference voltage generator is rotated in synchronism with the reflector and the phase of the antenna modulation is compared with the phase of the reference voltage to indicate the direction of arrival of the signal. It is concluded that the application of diversity techniques to UHF direction finding results in a decided improvement over conventional single antenna systems in terms of bearing reliability and accuracy. This equipment has been accepted by USAF and is being used operationally both in the Continental United States and its oversea bases. (a-1, b-1, c-1, d-1, e-27, f-Description)

3589. DE FAYMOREAU, E., "Experimental Determination of TACAN Bearing and Distance Accuracy," Trans. IRE, vol. ANE-3, no. 1, pp. 33-36; March 1956. ABSTRACT: TACAN is a radio navigation system which furnishes direct reading meter indications of bearing and distance. Both functions make use of the same radio frequency elements of the equipment, but the processes of measurement are different, hence the accuracies of the two functions are evaluated separately. This paper describes the methods used to determine the accuracy of TACAN bearing and distance functions, and gives the results obtained. The TACAN bearing function, with its use of multilobe antenna patterns, pulse transmissions, and physically rotating antenna elements, presents a number of differences in comparison to other bearing systems. Each of these differences in mode of operation produces certain advantages, but the question which primarily interests the user is "What is the over-all improvement?"; or more specifically, "What is the accuracy of the TACAN bearing readings during actual service?" Errors in radio bearing systems are due not only to finite accuracy limits of the equipments (instrumental errors) but also to disturbances of the radio signals in propagation from the ground station to the airplane (site errors). The multilobe operation of the TACAN system has been designed to accomplish a significant reduction in both types of error. Propagational errors are the most troublesome type in the practical operation of radio bearing systems, hence a realistic assessment of the accuracy of the system requires not only laboratory tests of the equipment, but measurements of accuracy during actual flights. (a-1, b-1, c-1, d-1, e-0, f-Evaluation)

3590. DINNEEN, G. P., AND REED, I. S., "An Analysis of Signal Detection and Location by Digital Methods," IRE Trans., vol. IT-2, pp. 29-38; March 1956. ABSTRACT: An analysis of the detection and location of repetitive signals in noise by digital techniques is made. The problem of location of the center of signals, herein denoted as beam-splitting, is explored. A Monte Carlo method employing a high speed digital computer was used to obtain quantitative results for a variety of digital detectors. A method of mathematical analysis is described and used to check computed results. The work described differs from much of the previous literature on detection or statistical decision theory in that an estimate of signal location is demanded. (a-5, b-1, c-1, d-1, e-0, f-Analysis)

3591. FANTONI, J. A. AND BENOIT, R. C., "Doppler Type Higy-Frequency Direction Finder," Convention Record of the IRE; March 1956. ABSTRACT: A high-frequency radio direction finder based on the Doppler principle for wave motion as applied to radio waves has been developed at Rome Air Development Center. The equipment, designed and fabricated by General Electric Company for RADC, embodies the design parameters evolved through joint Air Force/Signal Corps effort and is primarily designed to cover the frequency range of 1-30 magacycles. The antenna system consists of 31 monopoles having an array diameter of 150 feet. The relative phase of the signals induced in each antenna of the circular array is determined by the direction of arrival of the signal. A mechanical scanning switch capacitively couples the signals from adjacent antennas and combines them in succession to produce a frequency modulated signal. The phase of the modulation envelope of this signal is measured to determine the bearing of the received signal. A detailed presentation is given of the basic principles, overall system parameters and the model performance characteristics. Of the several components comprising the system, the radio frequency switch, magnetic signal storage device and the bearing indicator are discussed. Performance tests show that the system instrument error is approximately ± 1/4 degree and the overall bearing accuracy, including propagation or transmission effects, is in the order of ± 1 degree. In general, the bearing accuracy is considered superior to that of other systems, such as the Adcock Direction Finder. (a-1, b-9, c-1, d-1, e-293, f-Experimental results)

3592. RINDFLEISCH, H., "The 'Wullenwever' Long-Base Direction-Finding Installation," Nachrichtentech. Z., vol. 9, pp. 119-123; March 1956. ABSTRACT NO. 1: This system was developed during the war and is described in Radio Research Special Report No. 21, 1951; Radio Direction Finding and Navigational Aids, Some Reports on German Work Issued in 1944-45. ABSTRACT NO. 2: This is a fixed station equipment for the 17-34m band. It consists of 40 vertical dipole elements arranged symmetrically around a circle of 100 m diameter. At the centre is a cylindrical reflector 1/4 wave-length distant from the elements at the lowest end of the band. At any one time two adjacent groups of four elements are used and compensation for phase differences is affected by means of a rotatable system of delay networks. Each element is a broadband dipole with an added top capacitance. Results are presented on a crt using the sum and difference technique of W. Crone. The system claims to be 32 times as sensitive as a simple Adcock system and free from all interference and error-introducing effects. (a_1-3, a_2-5, b-2, c-4, d-4, e-0, f-Description)

3593. WHALE, H. A. AND ROSS, W. J., "An Automatic Direction Finder for Recording Rapid Fluctuations of the Bearing of Short

Waves," Proc. Phys. Soc., vol. 69, pp. 311-320; 1 March 1956. ABSTRACT NO. 1: The signals in two pairs of antennas placed at the corners of a rectangle 10 m X 5 m are combined so that a required 90° phase shift is automatically maintained at all frequencies up to about 17 mc; sense is determined manually. The accuracy of the system is discussed; the effective aperture must be small if it is to follow bearing fluctuations when there is an appreciable spread of the component waves in the incoming signal. ABSTRACT NO. 2: A direction finder which aligns itself along the horizontal projection of the wave normal of a radio wave is described. The system uses two pairs of aerials situated at the corners of a rectangle about 10 m by 5 m, the signals in each pair of aerials being combined in such a way that a required 90° phase shift is maintained accurately at all frequencies up to about 17 Mc/s. Sense determination is manual. The accuracy of such a system is discussed and it is shown that the aperture of a direction finder must be small if it is to follow bearing fluctuations when there is an appreciable spread of the component waves in the incoming signal. (a_1-3, a_2-5, b-1, c-1, d-5, e-0, f-Description)

3594. COLIN, R. I., AND DODINGTON, S. H., "Principles of 'Tacan'," Elect. Commun., vol. 33, no. 1, pp. 11-25; March 1956. ABSTRACT: Tacan is a polar coordinate aid to air navigation working in the 1000 Mc/s band. A transmitter-receiver in the aircraft interrogates a beacon on the ground and the time interval between transmission and the reception of the reply pulse gives a measure of the aircraft's distance from the beacon. To prevent interference by replies to other interrogating aircraft, the prf of each aircraft's transmission is jittered and the replies are strobed by a narrow range gate. This is automatically advanced step by step during the process of searching, and at each range interval - measured from the interrogation pulse - a count is made for a given number of replies in a fixed time. When the count shows that regular replies are being received the search stops and the range gate follows the very slow variations in time delay due to the aircraft's motion. The position of the delay control is used to control a meter which displays in figures the distance in miles. Bearing information is introduced at the ground beacon by a reflector rotating round a stationary aerial at 15 rev/sec. The pulses radiated in any direction are thus amplitude modulated with a 15 c/s sinusoidal envelope. To give a smooth envelope, the beacon always transmits at the same rate. If less than 100 aircraft (the beacon capacity) are interrogating, agc causes the transponder to be triggered by noise to make up the const. number of pulses. Phase reference pulse groups are inserted at an appropriate instant in the aerial rotation. At the aircraft the phase of the demodulated pulse envelope is measured by a rotary phase-shifter the shaft of which controls the bearing indicator. An outer array of nine reflectors at the ground aerial provides a 135 c/s modulation which enables fine bearing measurements to be made, further reference pulses being inserted for this purpose. This facility also reduces the effects of site errors. The average system error is 3/4°. The service range is 200 nautical miles. (a-3, b-2, c-1, d-5, e-0, f-Description)

3595. BROWN, G., "Antenna Group OA 463(XE-1)/TLR-1, Broadly Directional (Development Model)," Gabriel Laboratories, Needham Heights, Massachusetts, Final Report, Contract No. DA-36-039sc-42604, ASTIA No. AD-153 495; April 1956. ABSTRACT: A transportable, remotely controlled, search antenna system, antenna group OA-463(XE-1)/TLR-1, was developed and manufactured for use with the countermeasures receiving set AN/TLR-1. The equipment covers the range of 9.5 to 12,000 mc in 10 frequency bands. Four long wire antennas cover the range of 9.5 to 62 mc in 2 bands. Remotely steerable sloping-vee antennas were supplied for horizontally polarized signals and manually rotatable inverted-vee's for vertical polarization. Four remotely controlled, broadband sleeve - dipole fed corner reflectors were employed to cover the range of 61 to 1030 mc. Sleeve dipoles in 135° corner reflectors provide the required patterns without squint and the impedance match is less than 2.2:1.0 over the band. Four remotely controlled, broadband pyramidal horns were employed to cover the range from 940 to 12,000 mc. One control console provides all the controls and indicators needed to operate all antennas and pedestals in the antenna group. The masts designed for the long wire antenna bands 1 and 2 are made of 6-ft sections of fiberglas, properly glued to withstand wind and ice loading. The towers (pedestals) developed for bands 3 to 10 provide critical reduction in weight. Azimuth rotators for the pedestals employ lightweight drive motors and gear trains in watertight Al castings. The drive for each is continuous, reversible, and employs a self-locking brake for accurate positioning (±2°). Six rotators, which provide elevation and polarization positioning for the antennas in bands 3 to 10, have characteristics similar to the azimuth rotators. (a-3, b-3, c-1, d-1, e-0, f-Report)

3596. WAIT, J. R., "Radiation from a Vertical Antenna over a Curved Stratified Ground," Journal of Research of the National Bureau of Standards, vol. 56, no. 4, Research Paper 2671; April 1956. ABSTRACT: The problem of a radial electric dipole outside a concentrically stratified spherical conductor, such as the earth, is formulated. The solution is facilitated by considering the analogous nonuniform transmission line for the radial modes. The general result is then transformed to a Watson-type residue or azimuthal mode series, which reduces to the well-known result for the homogeneous earth as a special case. Following a method introduced recently by Bremmer, the residue series is converted to an alternative expansion, which is more suitable at short distances. The leading term of this new expansion corresponds to the case of the transmitter and receiver over a plane stratified conducting earth. (a-1, b-1, c-1, d-1, e-0, f-Description)

3597. BRAMLEY, E. M., "Directional Observations on H.F. Transmissions over 2100 Km," Proc. IEE vol. 103, Part B, no. 9, pp. 295-300; May 1956. ABSTRACT: Measurements carried out between December 1952 and October 1954 on signals transmitted from Malta, observations being made with wide aperture spaced loop direction finding system at Winkfield, Berkshire; measurements were made to determine inaccuracies in bearings at this distance caused by ionospheric effects as compared with results obtained at short distances. (a-3, b-1, c-1, d-5, e-0, f-Experiment report)

3598. VINCENT, C. H., "Phase-Angle Measurement, C.R. Tube Methods," Wireless Engineer, vol. 33, no. 5, p. 113; May 1956. ABSTRACT: The paper discusses the method of phase-angle measurement due to Fleming, in which X and Y deflections are adjusted for equality, and the phase difference is deduced from the proportions of the resulting ellipse. A thorough analysis is made of the geometrical factors which might lead to error in this method, and it is found that, provided the method is modified slightly to take certain reasonable precautions, it is an accurate and practical one at all phases, in spite of certain criticisms which have been made. (a-1, b-2, c-1, d-5, e-0, f-Discussion and analysis)

3599. BERRY, D. G., AND KREER, J. B., "An Analytical Study of Spaced Loop ADF Antenna Systems," Antenna Lab. Tech. Report No. 10, University of Illinois E.E. Research Lab, Urbana, Illinois, Contract AF 33(616)-3220, Wright Air Dev. Cen.; 10 May 1956. ABSTRACT: The development of an antenna system for use in radio direction finding in the 3-18 mc frequency range is made necessary by the severe limitations that are inherent in the ordinary rotatable loop antenna in this range. The single loop, whether mounted on an aircraft or in free space, introduces an error in the RDF system whenever the exciting wave is not incident from the horizon. This error is due to the voltage induced by the horizontally polarized portion of the field. Because ionospherically reflected waves are common in this frequency range, this polarization error is a serious enough defect to make the single loop unusable for airborne RDF. Another error arises from the fact that the longest portions of modern aircraft are long enough to be appreciable portions of a wavelength in the 3-18 mc range. Because of this, large currents are induced in the wings, fuselage, etc., by an incident wave. The fields reradiated from these currents induce voltages in the loop antenna which are not simply related to the direction of arrival of the incident field and, therefore, cause further error to be introduced into the system. The approach taken in an attempt to devise an antenna system which would provide reliable RDF information in the frequency range under consideration was to space a number of fixed, flush mounted, suitably interconnected, loop antennas about the aircraft. Although this idea is not new, recent work with ferrite cores indicates that it is now possible to get sensitivity adequate for RDF work from flush mounted loops. Flush mounting is, of course, essential on high speed aircraft. That a system of spaced loops would give an improvement in polarization error is suggested by the fact that two loops closely spaced in free space, connected in phase opposition and oriented so that they are either coaxial or coplaner, are free of polarization error. That is, the pattern of the loops maintains two of its nulls in the same position regardless of the polarization of the incident field. (a-1, b-1, c-1, d-1, e-28, f-Theoretical treatment of an Adcock using directional elements)

3600. BAIN, W. C., AND GLASS, C. B. I., "The Polarization of Very Long Waves Reflected from the Ionosphere," Proc. IEE, Part C, pp. 447-448; June 1956. ABSTRACT: A study of some additional evidence has been made to determine the polarization of radio waves reflected from the ionosphere at 16 kc/s over a transmission path 540 km long. The ratio between the amplitudes of the vertical and horizontal electric fields is found to be appreciably greater than unity, the mean value of the determinations made here being 5. (a-1, b-1, c-1, d-5, e-0, f-Study)

3601. FANTONI, J. A., AND BENOIT, JR., R. C., "Design of

Height-Diversity U. H. F. Direction Finders," Tele-Tech and Electronic Ind., vol. 15, pp. 90-92, 200-203; June 1956. ABSTRACT NO. 1: Description of the U.S.A. Type-AN/CRD-6 equipment for the frequency range 225-400 mc. The transition of military ground-to-air and air-to-ground line-of-sight communications from the VHF 100 to 156 MC frequency range to the UHF 225 to 400 MC frequency range made necessary the development of a ground based direction finding facility capable of operating in the UHF range in conjunction with radio transmissions from high performance type aircraft. Development effort which culminated in the finalized equipment was initiated by Watson Laboratories (later, the Rome Air Development Center) and was pursued jointly by the Air Force and Federal Telecommunication Laboratories. ABSTRACT NO. 2: A D/F system is described which works in the frequency band 225-400 Mc/s. In this a parasitic dipole is rotated about a fixed dipole at 1800 rpm, thus giving an amplitude modulation of the received signal. The phase of this modulation is interpreted by a phase-comparator bearing indicator. Remote control is provided together with multiple display units. Two aerial systems 20 and 26.6 ft above ground form the diversity system which is used. An automatic comparator selects the stronger signal. Performance data are given. (a_1-1 and 4, a_2-3, b-2, c-1, d-1, e-292, f-Description)

3602. KRONJAEGER, W., AND VOGT, K., "Investigation of Earth-Aerials (Long-Wave Directional Receiving Arrays)," Nachrichtentech. Z., (NTZ), vol. 9, no. 6, pp. 245-249; June 1956. ABSTRACT: It is shown that this type of aerial has the same characteristics as a frame aerial with its axis vertical. Where sufficient space is available it has some advantage because of its simplicity of construction. Results are given of measurements with an experimental array. (a-2, b-2, c-4, d-4, e-0, f-Study)

3603. MIRAM, P., "Night Effect in Radio Direction Finding," Elektronische Rundschau, vol. 10, pp. 163-166; June 1956. ABSTRACT: Different types of night effect and techniques for dealing with them are described. Screen displays obtained with crossed-loop and Adcock antennas under various propagation conditions are tabulated. (a-5, b-2, c-4, d-4, e-0, f-Description)

3604. TROOST, A., "A New Ship's Direction-Finder with Visual Indication: Telegon III," Telefunken Ztg., vol. 29, pp. 109-116; June 1956 ABSTRACT: The system described uses a new type of "magic eye" indicator, which shows two luminous lines of equal length for the minimum-signal setting of the goniometer. Aural balance indication is also available. (a-3, b-2, c-1 and 4, d-4, e-0, f-Description)

3605. WAIT, J. R., "Low Frequency Radiation from a Horizontal Antenna over a Spherical Earth," Can. J. Phys., vol. 34, no. 6, p. 586; June 1956. ABSTRACT: The problem of the radiation from a horizontal antenna at low radio frequencies over a spherical earth is discussed. The solution is facilitated by considering that the surface of the earth can be characterized by a boundary impedance. It is shown that, in general, both vertically and horizontally polarized waves are radiated along the surface of the earth. At short distances for a homogeneous earth, the expressions are in agreement with Norton's formulas for the radiation field of a horizontal dipole over a flat earth. (a-1, b-1, c-1, d-7, e-485, f-Theory)

3606. ALCOCK, G. M., "The Prediction of Maximum Usable Frequencies for Radio Communication over a Transequatorial Path," Proc. IEE, vol. 103, Part B, no. 10, pp. 547-552; July 1956. ABSTRACT: Times of reception of 15 Mc/s radio waves over a trans-equatorial path of 7500 km have been recorded throughout the recent period of declining solar activity (1950-54). The analysis of these times has shown that predictions of maximum usable frequency made by the usual control-point method were, in general, too high by about 4 Mc/s, and at times by as much as 7 Mc/s or more. This is contrary to the normal experience for long transmission paths lying within a single hemisphere. When a transmission mechanism involving multiple geometrical reflections is assumed instead of the forward-scattering mechanism implied by the control-point method, it is found that the path can be considered, for the purpose of predicting maximum usable frequencies, to consist of three reflections. The discrepancies between prediction and observation, which still remain after a 3-reflection mechanism has been invoked, are attributed mainly to reflections from the sporadic-E region at the southernmost reflection point, although it is possible that lateral deviation of the radio waves is also a contributing factor. (a-1, b-1, c-1, d-5, e-0, f-Observation and study)

3607. BAILEY, A. D., ET AL., "Radio Direction-Finder Bearing Computers. Summary Technical Report under Contract Nonr-1834(02), NR 371-161," University of Illinois, Engineering Experiment Station Project Technical Report No. 2; July 1956. See also Department of Commerce PB127466, ASTIA No. AD-101963. ABSTRACT: Sixteen systems are proposed for sector-type and omnidirectional-type analog bearing computers for use with small aperture radio direction finders. Certain of the systems have been realized in the laboratory. Others remain in the paper stage, either because of the relative complexity, or non-immediate application. Several of the analog systems yield data in a form that is ready for immediate processing by digital computers that function in real time. Contract Nonr-1834(02), NR 371-161. (a-3, b-3, c-1, d-1, e-954, f-Project report)

3608. BAIN, W. C., "Fluctuations in Continuous-Wave Radio Bearings at High Frequencies," Proc. IEE, Part B, vol. 103, p. 560; July 1956. ABSTRACT NO. 1: The investigation reported previously covering the frequency band 6-20 mc, is extended to cover the band 3-4 mc. The results differ from those obtained previously in that the standard deviation in a group of observations is not correlated significantly with the value of τ_0. ABSTRACT NO. 2: Bearing observations have been made with an Adcock direction-finder on distant transmitters in the 3-4 Mc/s range, and the auto-correlation function of their time variation has been calculated. Curves of the form $\exp(-\tau/\tau_0)$ have been fitted to the functions obtained, the resulting values of τ_0 having a mean of 0.81 sec. The results differ from these in the 6-20 Mc/s band in that the standard deviation in a group of observations is not correlated significantly with the value of τ_0. (a_1-3, a_2-3, b-1, c-1, d-5, e-0, f-Study)

3609. BAUR, K., "Contribution to the Goniometers and Coordinate Transformers," Frequenz, vol. 10, no. 7, pp. 213-221; July 1956. ABSTRACT: Solutions for the magnetostatic boundary conditions and equations for the rotor-stator coupling factor and rotor voltage are derived and used to analyze the operation of a simple goniometer and of a coordinate transformer. The latter is a goniometer with two rotor coils at right angles to provide the two signals for the cro display when a multi-element antenna system is used. The reduction of system errors by a method of harmonic compensation is detailed and examples are given. The whole D/F system is treated as a network to derive error equations. Errors introduced by the calibration equipment are also examined. (a-5, b-2, c-4, d-4, e-482, f-Theoretical analysis)

3610. BAUR, K., "The Calibration of a 6-Mast Adcock Array," Nachrichtentech. Z., vol. 9, pp. 299-305; July 1956. ABSTRACT NO. 1: A raised test transmitter in the vicinity of the array provides a beam of the desired oblique incidence but also causes a complex bearing error due to beam divergence. The real part of this error consists of the natural system error for plane-polarised waves, modified by a divergence error, and the imaginary part determines the blurring effect. A minimum divergence error, irrespective of ground conditions, is obtained for an angle of elevation of 40° and the error may be neglected where the transmitter distance exceeds 15a, where a is the distance between opposite masts. ABSTRACT NO. 2: Errors in the indication of direction occur when the effect of earth's conductivity and the nature of its surface are neglected. In order to minimise this effect the test transmitter can be placed above the earth in homogeneous surroundings. The purpose of the work is to establish the magnitude of the error of direction, at given heights of the transmitter above earth, as a function of its distance from the receiver. (a_1-3, a_2-3, b-2, c-4, d-4, e-0, f-Description)

3611. BROERSMA, C. B., "Recent Developments in Ship Direction-Finders and Course Beacons," T. Ned. Radiogenoot., vol. 21, no. 4, pp. 151-160; July 1956. ABSTRACT: Navigation on board ship can be divided into (1) oceanic navigation; (2) landfall navigation; (3) narrow water navigation. Electronic navigational aids exist which are most suitable for each of these categories. Some modern developments in direction-finding techniques and course beacons are described in more detail. (a-3, b-1, c-12, d-12, d-0, f-Survey)

3612. HOPKINS, H. G., "D.F. Plotting Aid," Wireless Engr., vol. 33, pp. 173-175; July 1956. ABSTRACT: A simple plotting aid is described for use in determining the contour enclosing the area within which the transmitter lies with a given probability. It is in the form of a transparent graticule which is placed on the map over the most probable point and is designed to facilitate the calculations. The aid is flexible in application and suitable for use where speed is required rather than the highest accuracy. (a-3, b-2, c-1, d-5, e-0, f-Description)

3613. KNUDSEN, H. L., "Radiation from Ring Quasi-Arrays," Trans. IRE, vol. AP-4, no. 3, pp. 452-472; July 1956. ABSTRACT:

The present paper constitutes a summary of investigations of certain antenna systems with rotational symmetry, so-called ring arrays and ring quasi-arrays, which have turned out to be or can be supposed to become of practical importance. Particular stress has been laid on an investigation of the field radiated from homogeneous ring arrays of axial dipoles and nomogeneous ring quasi-arrays of tangential and radial dipoles; i.e., systems of respectively axial, tangential, and radial dipoles placed equidistantly along a circle and carrying currents of the same numerical value but with a phase that increases uniformly along the circle. At first a calculation has been made of the radiated field in the case where the number of elements in the antenna system is infinitely large. After that the influence of the finite number of elements is accounted for by the introduction of correction terms. Subsequently, the radiation resistance and the gain have been calculated in a few simple cases. The antenna systems described may display super-gain. On the basis of the theory of super-gain an estimate is made of the smallest permissible radius of these antenna systems. Further an investigation is made of the field from a directional ring array with a finite number of elements to ascertain in particular the influence of the field of the finite number of elements. (a-1, b-1, c-1, d-1, e-0, f-Survey and discussion)

3614. MCKINLEY, D. W. R., AND MCNAMARA, A. G., "Meteoric Echoes Observed Simultaneously by Back Scatter and Forward Scatter," Can. J. Phys., vol. 34, no. 7, pp. 625-637; July 1956. ABSTRACT: Not available. (a-4, b-1, c-1, d-7, e-0, f-Observations)

3615. LASTER, C. C., "Evaluation and Comparison of Model DAQ and Model AN/SRD-7 Shipboard Radio Direction Finder Equipments," Task Summary Report Number I, Contract NObsr-64585, Southwest Research Institute, San Antonio, Texas; 9 July 1956. ABSTRACT: This report presents information required as described under Project Phase I of Contract NObsr-64585, a shipboard radio direction finder project at Southwest Research Institute. It is the purpose of Phase I to study and evaluate present high frequency shipboard radio direction finder equipments. The material in this report deals with the testing and evaluation of two direction finders - the Model DAQ, a World War II development by Federal Telephone and Radio Corporation, and the AN/SRD-7, recently developed by Stewart-Warner Electric Co. The direction finder tests were performed at Southwest Research Institute at the D/F field test site and in an 8 ft. X 10 ft. double shielded room in the Electrical Engineering Laboratory. The tests contained herein were performed in accordance with the general concepts of direction finder tests as stated in Standard Direction-Finder Measurements, Reference 1. Some minor deviations of the suggested tests procedures were required to simplify or improve testing of the equipments involved. (a-1, b-3, c-1, d-1, e-1000, f-Evaluation report)

3616. ANONYMOUS, "Technical Manual for Direction Finder Set AN/SRD-9," Federal Telecommunications Laboratories, Nutley, New Jersey, NAVSHIPS 92806; 16 July 1956. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-955, f-Instruction manual)

3617. ECKART, G., "USW Fading and Its Analysis," Z. angew Phys., vol. 8, no. 8, pp. 407-416; August 1956. ABSTRACT: Not available. (a-4, b-2, c-4, d-4, e-0, f-Analysis)

3618. GROSSKOPF, J., AND VOGT, K., "The Effect of Ground Inhomogeneities on the Calibration of Direction Finders," Nachrichtentech. Z., vol. 9, pp. 349-355; August 1956. ABSTRACT NO. 1: Investigations show that the maximum bearing error on medium and short waves due to local ground conductivity variations of up to 1:10 is unlikely to exceed 2°; this figure may be increased by re-radiation. To forecast the azimuthal error in the D/F signal from conductivity measurements is only possible where the distribution of ground conductivity values follows a simple pattern. ABSTRACT NO. 2: A linear relation was found experimentally between maximum conductivity variations along the periphery of a given circle around the position of the equipment and the mean value of the bearing errors for a number of sites. Conductivity variations of up to 400% resulted in a bearing error of 1°. The effect of secondary reflectors, present at many sites, is closely investigated. Studies of transitions in the ground conductivity show a maximum bearing error of 2° in the s.w and m.w. bands. A determination of the azimuthal distribution of the signal strength by means of conductivity measurements is possible only for simple shapes of the conducting surface. (a_1-3, a_2-3, b-2, c-4, d-4, e-0, f-Study)

3619. LITTLE, C. G., RAYTON, W. M., AND ROOF, R. G., "Review of Ionospheric Effects at VHF and UHF," Proc. IRE, vol. 44, no. 8, pp. 992-1018; August 1956. ABSTRACT: Summarises the present-day knowledge of ionospheric effects at vhf and uhf with the exception of forward scattering of vhf radio waves by the ionosphere. The 7 effects covered are: radar echoes from aurora, radar echoes from meteors, the Faraday effect and radar echoes from the moon, radio noise of auroral origin, absorption of radio waves by the ionosphere, refraction of radio waves by the ionosphere, and the scintillation of the radio stars. Each ionospheric effect has in turn been divided into separate subtopics, the main results being given. There are 182 references. (a-1, b-1, c-1, d-1, e-0, f-Survey)

3620. STEINER, F., AND STITTGEN, H., "On the Reduction of Multipath Direction Finding Errors by Long Base Line Systems," Nachrichtentech. Z., vol. 11, no. 8, pp. 417-423; August 1956. ABSTRACT: Expressions are derived for the maximum errors for Adcock and Doppler systems as functions of baseline d/λ. An improvement factor, due to increased d/λ, is defined by comparison with the max. error with a vanishingly small baseline. With Adcock aerials the improvement is accompanied by ambiguities due to lobes in the aerial polar diagram but this is not so with the Doppler system. Graphs are given, relating max. error with d/λ and the ratio of the amplitudes of the incident waves. (a-2, b-2, c-4, d-4, e-0, f-Theory)

3621. LOVEBERG, A. G., "The Reliability of Shipboard High Frequency Direction Finder Calibration," U.S. Navy Electronics Laboratory, Report 710; 30 August 1956. ABSTRACT: The usefulness of the high frequency direction finder (HF-D/F) aboard ship is determined primarily by its reliability, which encompasses two factors: accuracy and stability. Considerable effort during recent years has made the electronic devices employed satisfactory in both of these respects. In addition, an effort has been made to locate the D/F antenna on the ship structure in such a manner that site errors are held to a minimum. In most cases, however, the site chosen still introduces more error that can be tolerated in direct operation of the equipment. To solve this problem, efforts have been made to calibrate the particular HF-D/F installation by recording the deviations from known signal sources and applying these to operational bearings taken later. This process is intended to permit full use of the accuracy provided by the electronic equipment by removing the residual site error. The following two requirements, however, limit the usefulness of any such HF-D/F calibration: first, the calibration must show the errors for any bearing that may be taken; second, the calibration must not change in the period between re-calibrations. To better satisfy the first of these requirements, methods have been devised to increase the number of frequencies sampled, to predict the best frequencies to sample, and to interpolate between the several calibration curves obtained. In respect to the second requirement, some rules have been devised to regulate the changing of the shipboard antenna site. However, each of these requirements can be only partially satisfied. The study reported here was made to determine the reliability (accuracy and stability) that can be expected from a normal shipboard HF-D/F calibration. For this purpose, numerous data from actual calibrations of types DAU and DAQ HF-D/F systems installed on destroyers and escort carriers were analyzed. It was soon found, however, that many pertinent data were lacking. Full-scale and model studies were, therefore, undertaken at the U.S Navy Electronics Laboratory to provide the additional information needed. These studies are being continued in an effort to extend the information contained in this report. The experimental program covered by this report was designed to answer two specific questions: (1) Does a normal shipboard calibration provide sufficient information for reliable application in the field? (2) Will the information remain reliable (i.e., be stable) over a period of time? As regards the first question, the answer depends on the way in which the bearing deviation varies with such factors as frequency and bearing, and can best be studied on the model range where control of these factors is possible and where several typical antenna sites can be employed. As regards the second question, two or more typical full-scale calibrations are required to determine whether the data will repeat reliably after an appropriate time interval. (a-1, b-3, c-1, d-1, e-168, f-Experimental results)

3622. BAIN, W. C., "Possible Errors of a Particular Wide-Aperture Direction Finder," Proc. IEE, Part C, vol. 103, pp. 313-324; September 1956. ABSTRACT: A study is made of the extent to which the high-frequency cyclical direction-finder devised by Earp Godfrey is subject to three common types of error. First, the result is presented of theoretical computations on the errors given by a practical fixed-antenna system in wave-interference conditions. The variance of these errors as the phase difference between the incident rays is varied is shown to be the same as that given by the ideal rotating-antenna version of this direction-finder; it is appreciably smaller than that of an Adcock for a system aperture of 4λ, and, in general, much smaller for an aperture of 10λ. Secondly, errors due to antenna interaction are considered for a system of 24 unipoles, 9 m high and 1.1 m in diameter, placed on a circle of 100 m diameter. It is concluded that the errors in indicated bearing are likely to be

negligible, provided that the antennas not in use at any instant are terminated by a resistor equal to their nominal characteristic impedance. Finally, the polarization errors examined for such a system in which surface feeders are used, without an earth mat, on ground of moderate conductivity; it is found to be small, being greatest at the low-frequency end of the band, where the standard-wave error is about 1° at 3 mc. With extended feeders the errors at low frequencies are reduced considerably. (a-1, b-1, c-1, d-5, e-0, f-Study)

3623. BRACEWELL, R. N., "Two-Dimensional Aerial Smoothing in Radio Astronomy," Australian J. Phys., vol. 9, no. 3, pp. 297-314; September 1956. ABSTRACT: The visibility of a Fourier component of a two-dimensional temperature distribution which is scanned by certain kinds of rigid aerial is given by the normalized complex autocorrelation function of the field distribution over the aerial aperture (assuming that turning the aerial in its own plane is not allowed). Hence, for finite aerials, the visibility of the Fourier components falls to zero at finite values of spatial frequency. Consequently observations need only be made at certain peculiar intervals whose size is worked out. Interpolation between observations so spaced can be carried out by a method which then, by a simple extension, permits filtering of data which are to be freed from high spatial frequencies. Both interpolation and filtering are basic processes in the handling of two-dimensional data and contour maps in radio astronomy. The restoration of smoothed data is discussed from the viewpoint that only the simplest operations on extensive two-dimensional data are feasible, and details of a suitable technique of restoration are summarized. Application of further smoothing to existing data is shown to be important, and a method for doing it is given, again under the restriction to simple operations. The flux density of a source is shown to be given exactly by summing one in four of the isolated values observed at the peculiar intervals. (a-1, b-1, c-1, d-11, e-0, f-Mathematical analysis)

3624. BRAMLEY, E. M., "H.F. Bearing Variations on an Adcock Direction-Finder," Proc. IEE, Part C, vol. 103, pp. 350-356; September 1956. ABSTRACT: Measurements on a number of transmitters at ranges from 1000 to 5000 km show that the variance of snap bearings within a period of half an hour is of the order of 10 deg^2. To reduce this variance by a factor of ten, time averaging over about 5 min is required when the bearings are taken at 10-sec intervals. Bearing changes from hour to hour and from day to day have a variance of about 1 deg^2 and thus set a limit to the error reduction obtainable by averaging over a half-hour period. The results are consistent with previously published estimates of bearing variances. (a-1, b-1, c-1, d-5, e-0, f-Reprint of Monogram 175R, April 1956)

3625. GABLER, H., GRESKY, G., AND WACHTLER, M., "The Analysis of Radio Bearings in the Presence of Rotating Fields," Arch. elekt. Ubertragung, vol. 10, pp. 383-391; September 1956. ABSTRACT NO. 1: The influence of out-of-phase reflections on the indication of a cro direction finder is similar to the effects of in-phase reflections causing the main bearing error. Experiments on board the research ship "Gauss" confirm the theoretical results. ABSTRACT NO. 2: A brief review of the properties of the various reflecting objects on ships is followed by an analytical investigation of the influence of elements, primarily producing rotary fields, on the indications of a visual direction finder. The results are widely analogous to the known influences of various reflecting objects on the bearing errors (theory of radio-beam deviation) and are confirmed by experimental investigations on board. (a_1-3, a_2-3, b-2, c-4, d-4, e-0, f-Analysis)

3626. MCMULLEN, C. G., "An Improved Medium-Range Navigation System for Aircraft," IRE Trans., vol. ANE-3, pp. 103-107; September 1956. See also Proc. IRE, vol. 44, p. 1897; December 1956. ABSTRACT: A survey of existing systems leads to the conclusion that range-measurement equipment is more precise than bearing-measurement equipment. The use of a computer with existing equipment is suggested to give range-range measurements in terms of elliptical or hyperbolic coordinates. (a-3, b-1, c-1, d-1, e-0, f-Survey)

3627. MILLINGTON, G., "The Use of a Horizontal Dipole as a Direction-Finding Antenna," Marconi Rev., vol. 19, pp. 97-118, 3rd Quarter 1956. ABSTRACT: The problem is considered in relation to the type of wave radiated by the transmitter, neglecting site, and instrumental errors. Conditions are analysed for both small and large angles of elevation at the receiver: examples show that errors may be very large in the latter case. A comparison is made between the vertical-frame and horizontal-dipole antennas for u.s.w.d.f.; the nature and order of bearing errors are similar for the two types. (a-3, b-2, c-1, d-5, e-0, f-Analysis)

3628. CLARK, C. W., AND PETERSON, W. W., "Motion of Sporadic-E Patches Determined from High-Frequency Backscatter Records," Nature, No. 4531, pp. 486-487; 1 September 1956. ABSTRACT: New evidence of the motion of "sporadic-E" ionization has been obtained at Stanford University from records of ionospheric sounding equipment which displays ground (or sea) backscatter as mirrored in ionospheric layers or reflecting clouds. Sproadic-E patches of relatively limited geographical extent (order of 10,000 sq. km.) often appear on the records of this apparatus, and their growth and motion can in some cases be followed. Whether this motion is due to physical translation of the ionized material (as by winds) or to some other cause such as motion of an ionizing agency is not known; however, it is of interest to compare observations made by this relatively new technique with earlier ones made by other means. The backscatter in use at Stanford employs a rotating unidirectional beam antenna of relatively low directivity, and a plan position (PPI) display. A 2-millisecond pulse having a peak power of one kilowatt is radiated at 17.3 and 30.66 Mc./s. The antenna rotates once per minute, and a photographic record is made of each scan in azimuth. The equipment has been operated virtually continuously since September 1952. Detailed observation of E_s clouds or patches showed that the number which can be clearly distinguished as separate events is approximately 2,700 in the three-year period. Duration of the individual patches varied from a few minutes to a maximum of 10.5 hr., with a mean value of 3 hr. Every patch was examined for indications of motion. If during a period of one half-hour a given patch did not dissolve or become mingled with other activity so that it could no longer be studied as a unit, it was chosen for plotting. The centroid of the patch, defined as the mean range and the mean angular position in azimuth, was plotted until the patch either moved out of range or was otherwise lost. A total of some 264 such tracks were studied and speed and direction information derived. These results are shown in Figs. 1 and 2. The speed distribution has a peak at 250 km./hr.; but a few very high-speed cases raise the mean value to 300 km./hr. In only nine cases out of 264 were speeds greater than 550 km./hr. recorded. Direction is predominantly toward the west, and in 80 per cent of the cases it was within 45° due west. It is interesting to note that the mean speed is approximately one-fourth of the speed of the subsolar point at this latitude, and the average direction of patch motion is the same as that of the subsolar point. Apparent speed of drift of these patches is in good agreement with that of ionospheric winds, as determined by the meteor trail drift method, and of E_s motion, as measured by the fading method. However, the predominant direction of motion of the sporadic-E patches in this study does not agree with the predominant directions of motions determined by the other methods. Moreover, the present work brought to light no diurnal changes in the direction of apparent motion as have previously been reported. Ferrell and Gerson have previously deduced sporadic-E cloud drift by a method somewhat analogous to the present one, utilizing radio amateur transmissions in the 50-Mc./s. band. While the speeds which they reported were in rough agreement with those of the present study, the directions reported were variable and showed no particular tendency to favour the west. The number of patches observed in this study is far larger than the number reported by Ferrell and Gerson. Supporting evidence for the reality of the patch position and time measurement was obtained with the aid of the C-3 vertical incidence ionospheric sounder at Stanford University. (a-1, b-2, c-1, d-5, e-0, f-Observation and analysis report)

3629. LEIFHEIT, S. E., AND SPRINGS, F. W., "Depth of Signal Penetration in Soil," University of Illinois, Radio Direction-Finding Section, Engineering Experiment Station, Technical Memorandum No. 3, BuShips Contract No. NONR-1834(02); 14 September 1956. ABSTRACT: Calculation of depth of penetration over three parameters was found to be too time consuming to be done by hand. The computation was therefore programmed for the Illiac (University of Illinois automatic electronic asynchronous digital computer). The following material is a statement and explanation of the problem and the resulting program for the computer. (a-1, b-3, c-1, d-1, e-753, f-Analysis)

3630. HELLIWELL, R. A., "Low Frequency Propagation Studies, Parts I and II," (I: Whistlers and Related Phenomena; II: Low and Medium Frequency Propagation Studies.) Stanford University, Electronics Laboratories, Contract No. AF 19(604)-795, ASTIA Nos. AD-110 184 and AD-110 185; 30 September 1956. ABSTRACT: Part I: The history of work on whistlers and related phenomena is summarized. Studies of whistlers at Stanford, begun in 1951, have provided new experimental and theoretical results. The diurnal curve of whistler rate was found to depend on whistler strength, indicating partial control of the diurnal variation by thunderstorms. A positive correlation with yearly variation in sunspot activity was found. Support for Storey's field-line path theory was obtained from a test in which southern hemisphere lightning was found to correlate with whistlers observed at Stanford. A broadband receiving and recording

system, employing two crossed vertical loops and a vertical monopole, was developed for the measurement of the direction-of-arrival and polarisation of sferics, whistlers, and other vlf signals. Results indicated a complex behavior of arriving whistlers. Part II: Part II includes the following three studies: (1) ionospheric drift measurements in the E region by R. W. Winkleman; (2) characteristics of sea reflection at 1.85 Mc by E. P. Anderson; (3) numerical solution of the full wave equation by I. W. Yabroff. (a-1, b-3, c-1, d-1, e-756, f-Study and survey)

3631. OWENS, C. D., "A Survey of the Properties and Applications of Ferrites below Microwave Frequencies," Proc. IRE, vol. 44, no. 10, pp. 1234-1248; October 1956. ABSTRACT: A review of the properties, applications, and engineering significance of ferrites below microwave frequencies is presented. The survey includes a discussion of the nature of ferrites, their magnetic and electrical properties, the use of the μQ product as a design index of efficiency, core losses, and the effects of air gaps. This is followed by a discussion of the use of ferrites in a wide variety of applications. A Bibliography is also included (a-1, b-1, c-1, d-1, e-0, f-Survey)

3632. KENNEDY, P. A., "Loop Antenna Measurements," IRE Trans., vol. AP-4, pp. 610-618; October 1956. ABSTRACT: Experimental measurements on three loop antenna configurations are presented. The technique for obtaining impedance and current distribution using a single-wire transmission line over an image plane is described with particular attention given to the difficulties encountered. The results are reproduced in graphical form, and for loops where theoretical results are available, curves comparing theory and experiment are presented. (a-1, b-1, c-1, d-1, e-0, f-Experimental study)

3633. LEITNER, A., AND WELLS, C. P., "Radiation by Disks and Conical Structures," IRE Trans., vol. AP-4, pp. 637-640; October 1956. ABSTRACT: The Lebedev integral transform is applied to a class of boundary value problems in the theory of diffraction and antennas, including circular disks, apertures and hollow conical structures. It is found that the conventional Wiener-Hopf technique, together with this transform, does not explicitly solve these problems. Instead, one is led to an infinite system of linear equations for the representation of the unknown transform function. (a 5, b-1, c-1, d-1, e-0, f-Theory)

3634. VAN BLADEL, J., Les Applications du Radar a l'Astronomie et a la Meteorologie, Gauthier-Villars, Paris; 1955. See Quart. J.R. Met. Soc., vol. 82, pp. 550-551; October 1956. ABSTRACT: The main emphasis is on meteors and precipitating clouds. References are given to nearly 200 papers dated between 1945 and 1954. (a-3, b-6, c-3, d-3, e-0, f-Reference book)

3635. PRZEDPELSKI, A. B., "High Frequency Man-Pack Direction Finder (AN/PRD-5)," A.R.F. Products Inc., River Forest, Illinois, Quarterly Report No. 4; Contract No. DA 36-039-sc-64707; ASTIA No. AD-128 852; 1 October 1956. ABSTRACT: A portable transistorized direction finder is being developed covering the RF frequency range of 550 kc to 20 mc. Specifications SCL-5062 and MIL-F-14072-(Sig C) were followed as closely as possible in the development of the first experimental model except that a separate vehicular power supply was eliminated which reduced the size by 1/2 cu ft and the weight by 10 lb and simplified the packing. An unshielded folding loop antenna made of painted aluminum tubing is used for direction finding. The antenna plugs into an antenna head which in turn plugs into the receiver case by means of 3 Microdot connectors. The head permits rotation of the antenna with respect to the receiver. The receiver covers the 0.55- to 20.0-mc range in 4 bands. An overlap of about 10% is provided at the ends of each band. Most of the electrical circuits are potted in 8 subassemblies. Switches, potentiometers, and trimmers are located either on the front panel or on the chassis and are driven from the panel. Concentric legs are used in the tripod construction to provide a height adjustment from 25.75 to 44 in. in 1-in. steps. A pack with materials and techniques suitable for military use was designed which was based on a model made by the Alaska Sleeping Bag Co. The vehicular mounting consists of a plate (to which the receiver can be locked) mounted on 4 shockmounts. Tests were made which demonstrated the feasibility of ultimately transistorizing the entire unit. See also AD-92 438. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See also Abstract No. 3354)

3636. BAILEY, A. D., AND WAVERING, A. J., "Separate Channel Averaging in a Matched Twin-Channel Radio Direction Finder," Proc. NEC, vol. 12, p. 249; 1-3 October 1956. ABSTRACT: In the present Watson-Watt type Radio Direction Finder Bearing Computer a bearing shifter is required to transform the axis of reference of the bearing data such that the bearings lie within the linear range of the computer. It is suggested and shown in this paper that if one first properly samples and averages the data of the separate channels, the need for the bearing shifter is eliminated. It is shown theoretically that the Separate Channel Averaging System contributes the same order of error due to wave interference as existing systems provided certain conditions are satisfied. For most cases of interest these conditions are compatible with what is observed to happen in practice. The complexity of the sampling technique and the experimental accuracy of the system are also discussed. (a-1, b-1, c-1, d-1, e-0, f-Description)

3637. WEBB, H. D. AND BITZER, D. L., "Linear Conversion of RDF Bearings for Panoramic Direction Finding and Bearing Averaging," Proc. NEC., vol. 12, p. 259; 1-3 October 1956. ABSTRACT: The procedure of taking bearings with a radio direction finder may be quite tedious and tiring to an RDF operator. Methods that may be used to increase operator efficiency are, therefore, of considerable interest. Two devices are described in this paper which may be used to replace or supplement RDF operator functions: (1) a panoramic RDF and (2) a bearing computer. The panoramic display is in rectangular coordinates, with frequency along the Y axis and bearing or azimuth along the X axis. The frequency axis display is accomplished by scanning the local oscillator of a matched channel receiver which has signal selection by local oscillator tuning only. The bearing axis display is accomplished by presenting the angle of tilt of the bearing ellipse of the Watson-Watt display along a linear time base. The method of achieving the linear bearing conversion display is described. The linear bearing display is in some respects superior to the Watson-Watt display under wave interference conditions. It may be used to operate a bearing computer which converts the bearing information into digital form. The principles of the bearing converter are described. (a-1, b-1, c-1, d-1, e-0, f-Description)

3638. RUMSEY, V. H., AND WEEKS, W. L., "Impedance of Ferrite Loop Antennas," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 13, Contract No. AF33(616)-3220; 15 October 1956. ABSTRACT: A variational formula for the imput impedance of a loop antenna with a ferrite core has been derived in terms of an assumed volume distribution of magnetization in the core. It takes the form

$$Z - Z_o = \frac{\left[\iint_S \frac{\underline{J} \cdot \underline{E}_k}{I} \, dS\right]^2}{\iiint_{core} \underline{K} \cdot \left(\frac{\underline{K}}{j\omega(\mu - \mu_o)} - \underline{H}_k\right) dV}$$

where Z = impedance of the antenna

Z_o = impedance when the ferrite is removed

$\underline{J}$ = surface density of electric current on the winding, assumed perfectly conducting

$\underline{K}$ = assumed volume density of magnetic dipoles

μ and μ_o represent the permeability of the ferrite and free space

$\underline{E}_k$ and $\underline{H}_k$ represent the free space field due to $\underline{K}$.

Effects of the winding arrangement, core losses and shape of core are contained in the formula. It reduces to a simple expression when applied to an electrically small antenna with ellipsoidal core. (a-1, b-3, c-1, d-1, e-527, f-Analysis)

3639. TRAVERS, D. N., "Direction-Finder, Radio, Shipboard, Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. 64585, ASTIA No. AD-124 470; 26 October 1956. ABSTRACT: The major effort has been directed toward the construction of a finalized prototype version of the SwRI calibration curve plotting equipment. The design for this unit has been specified and construction started. It is anticipated that the equipment will be ready for use away from San Antonio near the end of the next interim period. Minor changes from the original breadboard model are described and a block diagram is given. Work directed towards a major modification of the automatic plotter to provide automatic true bearing information has been started. Progress in the construction of a spaced loop model is described. Three models are in various stages of planning at the present time. One model now under test is for the purpose of determining the precision of balance required for a loop spacing of 4 inches. Another large scale model is being prepared to determine the degree of isolation necessary between spaced loops and sense loops. A third model is being planned which, when constructed, should be adaptable to the AN/SRD-7 antenna unit. The problem of constructing a rotating rf transformer to covert the AN/SRD-7 to spaced loop operation is described. Several designs are now being considered for construction by this laboratory. The possibility of using a modified Stewart-Warner transformer is also described. See also AD-116 442. (a-1, b-3, c-1, d-1, e-1000, f-Study and analysis)

3640. ANONYMOUS, "Handbook of Instructions for Direction Finder Set AN/ARD-10(XY-1)," Farnsworth Electronics Company, Fort Wayne, Indiana, Volume II, Contract AF 33(600)25523, ASTIA No. AD-147 080; 29 October 1956. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3641. BAUR, K., The Total Error in an Adcock Goniometer System," Arch. Elekt. Ubertragung, vol. 10, pp. 491-493; November 1956. ABSTRACT NO. 1: The calculation presented takes into consideration the interrelation between the goniometer and antenna errors and thus accounts for the discrepency between theory and practice at the higher frequencies. ABSTRACT NO. 2: It is shown why the bearing error of an Adcock direction finding system in the upper part of the frequency range must be many times above the value of the natural aerial system error expected from theory. The result of the calculation provides means for reducing the error below the theoretical limiting value. (a_1-3, a_2-5, b-2, c-4, d-4, e-0, f-Analysis)

3642. KOUYOUMJIAN, R.G., "Back-Scattering from Circular Loop (Antenna)," Ohio State Univ--Eng Experiment Station--Bul. no. 162, p. 36; November 1946. ABSTRACT: Variational method used to determine echo area of perfectly conducting, thin, circular loop; comparisons between calculated and measured values of echo area at loop broadside and edge aspects; echo area values of loop compared with those of circular plate, sphere, and straight wire; equivalent dipole sources associated with small loop scatterers; formula for echo area of large loops at broadside aspect. (a-3, b-3, c-1, d-1, e-0, f-Test and evaluation. See Abstract No. 3569 for possible earlier citation)

3643. STORER, J. E., "Impedance of Thin-Wire Loop Antennas," Trans Amer. Inst. Elect. Engrs. I, vol. 75, pp. 606-619; 1956. See also Commun. and Electronics, no. 27; November 1956. ABSTRACT: The Fourier series solution of Hallen (Nova Acta Regiae Societatis Scientiarum Upsaliensis (Ser. 4), Vol. 2, No. 4, November 1938) is modified in order that convergence difficulties be avoided. Extensive numerical results are given for the impedance of loops for various wire sizes, and circumferences up to 2-1/2 wavelengths. Curves are presented which aid in the computation of field patterns and current distributions. Experimental data given agree well with the theory. (a-2, b-1, c-1, d-1, e-0, f-Theory)

3644. WAIT, J. R. AND HOUSEHOLDER, J., "Mixed Path Ground Wave Propagation Studies; 2. Larger Distances," National Bureau of Standards, NBS Report No. 5029; Project NBS 8300-00-9083; 6 November 1956. ABSTRACT: The theoretical results given in Part 1 for ground wave propagation over a mixed path on a flat earth are generalized to a spherical earth. The problem is formulated in terms of the mutual impedance between two vertical dipoles which are located on either side of the boundary of separation. Extensive numerical results are given in graphical form for a mixed land-sea path at frequencies of 10, 20, 50, 100, and 200 kc. (a-1, b-3, c-1, d-1, e-930, f-Theory)

3645. BAUR, K., "An Investigation of the Sensitivity of the Direction Finder Telegon III with and without Rectification. Telefunken Ztg., vol. 29, no. 114, pp. 288-290; December 1956. (English summary, pp. 295-296). ABSTRACT: In the direction-finder Telegon III, signal strength is indicated by a vertical trace on a "magic-eye" crt. Three methods of applying the signal to the indicator, one direct and two using rectification, are compared to determine their merits regarding the indication of low-signal levels. Results are inconclusive. (a-3, b-2, c-4, d-4, e-0, f-Study)

3646. CRISSES, B., AND GNESSIN, J., "Portable Loop Homing Antenna," Radio-Electronics, vol. 27, no. 12, pp. 88-90; December 1956. ABSTRACT: The aerial is designed for use with a 50 Mc/s walkie-talkie set. The ends of a 2-turn loop are connected to a tuned circuit, transformer and step attenuator at the base of the frame. A centre-tap connection from the transformer primary to one end of the secondary provides the necessary "sensing". The collapsible frame is of plastic construction, is approx. 20 in. high when extended and weighs about 2 lb. (a-3, b-2, c-1, d-1, e-0, f-Description)

3647. HARKIN, B., "The Expected Error of a Least-Squares Solution of Location from Direction-Finding Equipment," Aust. J. Appl. Sci., vol. 7, pp. 263-272; December 1956. ABSTRACT: Formulas are derived for the error variances and covariances of the coordinate components of an unweighted least-squares solution for the location of a missile simultaneously reported by a number of optical or electronic direction-finding stations. Practical applications of the formulas are suggested. (a-1, b-1, c-1, d-11, e-0, f-Theory)

3648. MC CUE, C. G., "High-Frequency Back-Scatter Observations at Salisbury, South Australia," Australian J. Phys., vol. 9, pp. 454-470; December 1956. ABSTRACT: An improved pulse technique which permits simultaneous observation of time delay and elevation angle of arrival of ionospheric echoes has enabled recognition of seven different modes of backscatter propagation involving both ionospheric and ground origins. By the use of four transmitting aerials with differing directional characteristics, it is shown that land is a more prominent source of backscatter than sea at low angles of elevation and that extremely large changes in land roughness can be identified by the resultant increase of backscatter echo amplitude. (a-1, b-1, c-1, d-11, e-0, f-Observations and description)

3649. BOYER, J. M., RUSSELL, B. J., AND CAIN, E., "Polarization Modulation Distortion Effects from High Speed Missiles: with Relation to Cotar Position Determination System," Boundwith Cubic Corporation, Technical Report No. 3-50556; Contract No. AF 08(606)-785; ASTIA No. AD-124 140(a); 7 December 1956. ABSTRACT: A study was made to evaluate the possible reduction of detection range, and the error potential of polarization modulation distortion for the Cotar system. Mathematical relations were established for the dynamics of the missile-to-ground geometry with respect to time. An analysis of measurement data obtained at the Naval Ordnance Test Station, China Lake, proved that the major field radiated by a missle is elliptically polarized. The spin and trajectory velocity of a missile with respect to a fixed ground station were considered in the derivation of an expression for the complex polarized missile radiation field incident upon the ground antennas. When viewed from the ground station, the locus of the complex angular generator of this field was found to be a Loxodromic spiral. The instantaneous expressions of the Loxodrome were derived. Results of the analysis showed that linear-polarized ground-based antennas for the Cotar system are superior to circular polarized antennas even of the omnidirectional type. (a-3, b-3, c-1, d-1, e-0, f-Study)

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3650. ANONYMOUS, "Abstracts of the Annual Symposium No. 7 on the USAF Antenna Research and Development Program, 22-25 October 1957 (Held at) Robert Allerton Park, University of Illinois, Monticello, Illinois," ASTIA No. AD-138 500; 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3651. ANONYMOUS, "Measure beamwidth by Phase D/F," Radiotek and Elek., vol. Z, no. 6, p. 769; 1957. ABSTRACT: Not available. (a-4, b-2, c-4, d-4, e-0, f-0)

3652. ADACHI, S., MCDOUGAL, J. R., AND MUSHIAKE, Y., "Super Loop Antenna," Rep. Res. Inst. Elect. Commun., Tohoku Univ., Part B. vol. 9, no. 1, pp. 1-8; 1957. ABSTRACT: The measured directional patterns and input impedance characteristics are presented for the multi-element aerials constructed by arranging circular loops of gradually varying diameters concentrically about a supporting pipe of comparatively large diameter. These circular loops are electrically connected in parallel at their feed points by means of two symmetrically positioned rods. Principal features are mechanical ruggedness, ready adaptability to mast type mounting, high omnidirectional gain in the horizontal plane, and the feasibility of attaining about 10% bandwidth by means of impedance compensation. (a-2, b-1, c-6, d-6, e-0, f-Description)

3653. APPLETON, E., AND LYON, A. J., "Studies of the E Layer of the Ionosphere - I. Some Relevant Theoretical Relationships," J. atmos. terrest. Phys., vol. 10, no. 1, pp. 1-11; 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Study)

3654. BAUR, K., "Phase Distortions Due to Ground Inhomogeneities," Nachrichtentech. Z., vol. 10, p. 385; 1957. ABSTRACT: Not available. (a-4, b-2, c-4, d-4, e-0, f-0)

3655. BEYNON, W. J. G., AND BROWN, G. M., The Ionosphere, Annals of the International Geophysical Year, vol. III, Part 1; 1957. ABSTRACT: Not available. (a-4, b-6, c-1, d-5, e-0, f-0)

3656. BOWHILL, S. A., "Ionospheric Irregularities Causing Random Fading of VLF," J. atmos. terrest. Phys., vol. 11, pp. 91-101; 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Study)

3657. CARSWELL, I., AND FLAMMER, C., "Ground Antenna Phase Behavior in a Differential Phase Measuring System," IRE National Convention Record, Part 1, pp. 49-56; 1957 ABSTRACT: Not available. (a-4, b-9, c-1, d-1, e-0, f-0)

3658. EVANS, J. V., "The Electron Content of the Ionsophere," J. atmos. terrest. Phys., vol. 11, nos. 3 and 4, pp. 259-271; 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

3659. GERSHMAN, B. N., GINZBURG, V L., AND DENISOV, N.G., "Propagation of Electromagnetic Waves in a Plasma (Ionosphere)," Report AEC-tr 3493, Translated from Uspekhi Fis. Nauk., vol. 61, pp. 561-612; 1957. AEC Technical Information Extension, Oak Ridge, Tennessee. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Study report)

3660. GIBBONS, J. J., AND RAO, B. R., "Calculation of Group Indices and Group Heights at Low Frequencies," J. atmos. terrest. Phys., vol. 11, nos. 3 and 4, pp. 151-162; 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, 3-0, f-Analysis)

3661. HAZELGROVE, J., "Ray Theory and a New Method for Ray Tracing," The Physics of the Ionosphere Report of 1958 Cambridge Conference, p. 355; 1957. ABSTRACT: Not available. (a-4, b-9, c-1, d-1, e-0, f-Theory)

3662. KATO, S., "Horizontal Wind Systems in the Ionosphere E Region Deduced from the Dynamic Theory of the Geomagnetic Sq Variation; Parts II & IV," J. Geom-Geol., vol. 8, no. 1, pp. 24-37, no. 2, pp. 107-115; 1957. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-Study)

3663. MAMBO, M., "On Difference of foF2 between June and December Viewed from a World Wide Standpoint," J. of the Radio Research Labs., vol. 4, pp. 59-71; 1957. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-Theory)

3664. MITRA, A. P., "Nighttime Ionization in the Lower Ionosphere. I. Recombination Processes. II. Distribution of Electrons and Positive and Negative Ions," J. atmos. terrest. Phys., vol. 10, no. 3, pp. 140-162; 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Propagation theory)

3665. MIYA, K., ISHIKAWA, M., AND KANAYA, S., "On the Bearing of Ionospheric Radio Waves," Rep. Ionosph. Res. Japan, vol. 11, p. 130; 1957. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-Theory)

3666. MUNRO, G. H., "Travelling Disturbances in the Ionosphere: Changes in Diurnal Variation," Nature, vol. 180, p. 1252; 1957. ABSTRACT: In an earlier communication it was reported that the direction of horizontal movement of travelling ionospheric disturbances observed at Sydney, Australia, had a consistent diurnal variation during winter months in the years 1950-52; but no significant diurnal variation was then apparent in the summer. These conditions continued until 1955; but in the summer of 1955-56 a definite change appeared which was even more marked in 1956-57, the main feature being a marked change of direction from the south-east to the south-west quadrant about midday. The contrast is clearly evident in Fig. 1, which shows the mean diurnal variation in January for the years 1951-54 as compared with the variation for January 1957. The consistency of the results of 1951-54 is shown by the dotted lines, which indicate maximum deviation from the mean. It will be noted that the change from south-east to south-west quadrant in 1957 is quite sudden. This sequence is also found on a number of individual days, though not on all days. There was no significant change in mean speed over this time interval. (a-1, b-2, c-1, d-5, e-0, f-Propagation study)

3667. POKORNÝ, F., "An Automatic Aircraft V.H.F. Direction Finder," Slaboproudý Obzor, vol. 18, no. 4, pp. 175-179; 1957. ABSTRACT: This experimental Czechoslovak equipment has five fixed crystal-controlled channels over the frequency range of 118 to 132 Mc/s and gives an accuracy of ±3° at distances up to 150 km. The device consists of a pair of folded-dipole Adcock aerials, an omni-directional aerial, two pairs of balanced modulators, a combining circuit (for adding the outputs of the balanced modulators and the signal of the omni-directional aerial), a receiver with a detector and a pair of ratio discriminators: outputs of the discriminators are applied to a special time base which produces a radial trace on the screen of a c r tube, whose direction corresponds to that of the monitored signal. The equipment comprises also a monitoring transmitter, a remote-control panel and a remote-control switching system. (a-2, b-2, c-19, d-19, e-0, f-Description)

3668. STEWART, J. L., "On Ferrite Loop Antenna Measurements," IRE Convention Record, vol. 5, Part I, pp. 42-48; 1957. ABSTRACT: Air and ferrite cored small loop antennas are discussed. A general procedure for testing small ferrite antennas is outlined in which rf radiation performance is expressed in terms of quantities easily measured at audio frequencies. Only a single measurement is needed to characterize the elementary-dipole-type ferrite-loaded antenna. A number of measurement results are given which apply to the ferrite loop antenna, covering a broad range of core lengths and diameters. It is found that typical ferrite-loaded loops have little electrical advantage over air loops although the packaging advantage with ferrite loops may be significant. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

3669. THOMPSON, G. R., HARRIS, D. R., OAKES, P. M., AND TERRETT, D., The Signal Corps: The Test, December 1941 to July 1943, United States Army in World War II, Office of the Chief of Military History, Department of the Army, Washington, D.C.; 1957. ABSTRACT: This book makes numerous references to radio position finding and radio direction finding developments which came out of Fort Monmouth during the early portion of World War II. References are made to both cooperative and noncooperative direction finding, HF and VHF direction finding, and the high frequency SCR-274 which operated up to 20 mcs. The SCR-522, a VHF equipment, was also mentioned. Ground direction finding stations at VHF are described. Numerous other direction finding equipments are mentioned including the SCR-206-A. (a-4, b-6, c-1, d-1, e-859, f-Historical account)

3670. ANGULO, C. M., "Diffraction of Surface Waves by a Semi-infinite Dielectric Slab," IRE Trans., vol. AP-5, pp. 100-109; January 1957. ABSTRACT: The discontinuity at the end of the slab is regarded as the junction of an open dielectric-filled waveguide and a free-space waveguide. A variational expression is set up for the terminal impedance representing the effect of the discontinuity on the surface wave. Close upper and lower bounds for the impedance are obtained. A variational expression is also set up for the transfer impedance between the surface wave and one of the modes of the continuous mode spectrum associated with the free-space waveguide. The transfer impedances yield the modal amplitudes of the fields. The synthesis of all the modal components gives the electromagnetic field scattered by the end of the slab. The synthesis is carried out for the far field by the method of steepest descents. Terminal impedances and forward radiation patterns are plotted as functions of the thickness for several permittivities $\epsilon_r = 2.49; 10; 100$. The approximation obtained by the variational expression is excellent for small values of ϵ_r and begins to be bad for ϵ_r 10. For very large values of ϵ_r it is possible to obtain a rough estimate of the impedance, immediately, from the values for $\epsilon_r = 10$. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3671. ARTMAN, J. C., "Effects of Size on the Microwave Properties of Ferrite Rods, Disks, and Spheres," J. Applied Physics, vol. 28, no. 1, pp. 92-98; January 1957. ABSTRACT: The effects of sample size on the apparent properties of ferrites observed by microwave cavity perturbation methods are treated. Retardation effects associated with the propagation of electromagnetic waves in the specimen are considered. Results are given for the idealized cases of rods of infinite length and disks of infinite extent. Methods of adaptation to finite rods and disks are suggested. An approximate solution is given for the sphere which is in qualitative agreement with some aspects of the experimental observations. A formula relating to the shift in resonance field to the sphere size is presented. (a-5, b-1, c-1, d-1, e-0, f-Theory)

3672. HOLMES, F. W., "A Radio Phase Comparison System for Measuring the Direction of a C.W. Source," Royal Radar Establishment, ASTIA No. AD-138 234; January 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

3673. KATZIN, M., "On the Mechanisms of Radar Sea Clutter," Proc. IRE, vol. 45, no. 1, pp. 44-54; January 1957. ABSTRACT: Experimental data are described and discussed with reference to the physical principles involved. It is shown that the scattering elements are illuminated by a combination of direct and indirect fields, the latter being "reflected" by surface elements closer to the radar. At small

depression angles these interfere destructively, giving rise to the so-called "critical angle," polarization dependence, "spikiness," and steeper frequency dependence. A theory is developed in which the elemental scatters are taken to be the small patches, or "facets," of the surface. It is found that the facets which back scatter most effectively at small depression angles are those whose dimensions are of the order of the wavelength, and that the frequency dependence of the scattering parameter σ^0 at small depression angles is determined by the size distribution of the facets. If the size and slope distributions of the facets are independent of each other, then, below a high-frequency limit, σ^0 has essentially the same frequency dependence at low angles and high angles. The high-angle variation of σ^0 with angle is determined mainly by the slope distribution of the facets. With the slope distribution determined from optical measurements by Cox and Munk, (J. Opt. Soc. Amer., vol. 44, no. 11, pp. 838-850, Nov 1954), σ^0 is approximately proportional to wind speed at small depression angles, but inversely proportional to wind speed at vertical incidence. Using measured values of σ^0, the facet mechanism accounts for scattering by the entire surface of the sea. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

3674. KOPPEN, H., "The International Annual Conference on Radio- and Sound-Location in Hamburg 1956," Nachr-Tech., vol. 7, pp. 34-39, January 1957. ABSTRACT: Summaries of most of the lectures delivered at this conference. See also Elekt. Runds., vol. 10, pp. 343-348; December 1956; and vol. 11, pp. 27-29; January 1957. (a-3, b-2, c-4, d-4, e-0, f-Abstracts)

3675. MCCRACKEN, L. G., "Ray Theory vs Normal Mode Theory in Wave Propagation Problems," IRE Trans., vol. AP-5, no. 1, pp. 137-140; 1 January 1957. ABSTRACT: The Fuler-Maclaurin expansion, as a possible tool for summing mode series in wave propagation problems, is examined for the problem of a dipole radiating monochromatic energy between two parallel plates. When the expansion is applied to this problem, it is found that the expansion formula transforms the mode series into the known ray-theory solution. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3676. MOON, J. H., "The Design of Electromagnetic Radiogoniometers for Use in Medium-Frequency Direction-Finding," JIEE, Pt. III, vol. 94, pp. 69-77; January 1957. ABSTRACT: Radiogoniometers of accepted design possess inherent errors due to the coupling between the search-coil and the field-coil windings, and the magnitude of these errors increases with an increase of this coupling. In practical design a compromise has usually been effected between the tightness of the coupling and the permissible errors. A special study was made with the object of analysing the causes of these errors and of introducing modifications which, while providing a tighter degree of coupling to the search coil, at the same time reduce the magnitude of the instrumental errors. A preliminary examination of the various existing types of radiogoniometer shows that the errors are not uniformly "octantal" in form, and that the value of the maximum error is not necessarily directly proportional to the tightness of the coupling. Several methods of measuring the instrumental errors are described, and further information regarding the causes of apparently non-symmetrical errors is recorded. These are shown to be due to the vector addition of a number of separate errors all harmonically related in frequency but differing in phase relationship. A table shows the more important results obtained at various stages during the development of a new radiogoniometer at least 6 db better in signal/noise ratio than any existing design and possessing a maximum instrumental error of $< \pm 1/2°$. (a-2, b-1, c-1, d-5, e-0, f-Description)

3677. OHMAN, G.P., "Universal Curves for the Vertical Polarization Reflection Coefficient," IRE Trans., vol. AP-5, p. 140; January 1957. ABSTRACT: A set of universal curves is presented by which the approximate magnitude and phase of the reflection coefficient for vertical polarization can be determined at any grazing angle with relatively little computation. The approximation, which is almost always sufficiently accurate for engineering purposes, is excellent if the relative impedance of the reflecting medium is high and still quite good even if the impedance ratio is only moderately greater than unity. (a-1, b-1, c-1, d-1, e-499, f-Descriptive analysis)

3678. SENSIPER, S., "Cylindrical Radio Waves," IRE Trans., vol. AP-5, pp. 56-70; January 1957. ABSTRACT: The formulas required for simple accurate numerical evaluation of the radiation patterns from slots on large circular cylinders are derived. From the usual harmonic series, integral representations are obtained. These lead to either the residue series via the Watson transformation, or to the geometrical-optics representations via a saddle-point evaluation. Considerable attention is given to the calculation of the residue series constants so as to obtain sufficiently accurate numerical values for a wide range of circumference to wave-length ratios. Very good numerical agreement is shown between the representations derived here and results previously obtained from the harmonic series. The physical significance of the various representations is discussed and compared. (a-1, b-1, c-1, d-1, e-0, f-Numerical analysis)

3679. TRAVERS, D.N., "The Effect of Mutual Impedance on the Spacing Error of an Eight-Element Adcock," IRE Trans., vol. AP-5, no. 1, pp. 36-39; January 1957. ABSTRACT: An eight-element Adcock array has the advantage of reduced spacing error as compared to four-element arrays of the same size. If this error is calculated when the mutual impedance between elements are neglected, spacing error curves result which are poor approximations and may not be attainable in actual measurement. New relationships are derived for the two-phase eight-element array which include the effect of mutual impedance. Curves are plotted to show that earlier published values for the angular spacing between elements are probably too high to result in the best performance. It is shown that the value of p = 27°15' which results when the mutual impedances are neglected may result in an appreciable spacing error. It is apparent that the selection of an aerial becomes quite important since the mutual impedance is determined thereby. Evaluation of the error in a particular case will depend on the aerial selected. It is also shown that, if the goniometer impedance is high, the spacing error will be reduced. (a-1, b-1, c-1, d-1, e-354, f-Analysis)

3680. WAIT, J.R., "The Insulated Loop Antenna Immersed in a Conducting Medium," National Bureau of Standards Report No. 5042; 3 January 1957. ABSTRACT: A solution is given for the fields of a circular loop in a conducting medium. The loop is assumed to have a uniform current and it is enclosed by a spherical insulating cavity. The impedance of the loop is also considered. It is shown that the power radiated from the loop varies approximately as the reciprocal of the radius of the cavity for a specified loop current. Furthermore, if the cavity is electrically small, relative to the external medium, the radiation field is not significantly affected by the presence of the cavity. (a-1, b-3, c-1, d-1, d-318, f-Theory. See also Abstract No. 3740)

3681. JEAN, A. G., LANGE, L. J., AND WAIT, J.R., "Polarization of Sferics," National Bureau of Standards Symposium on the Propagation of VLF Radio Waves," Paper no. 32; 23-25 January 1957. ABSTRACT: Four quantities are required to characterize the incident wave: azimuth α, elevation angle θ, and electric field components E and E parallel to the plane of incidence and perpendicular to the place of incidence, respectively. At Boulder, the sferics recording installation consists of a vertical antenna and two crossed-loop antennas. The azimuth is determined from the ground-wave portion of the sferic as observed at Boulder and Stanford using broad-band direction-finding equipment. The analyses are made using the waveforms as recorded by the three separate antennas. Waveforms received from ranges of about 200-500 km, in which the ground-wave and sky-wave pulses can be separately distinguished, are the most amenable to analysis, but this type occurs infrequently. The peak amplitudes of the three waveforms are tabulated for the ground-wave and for the sky-wave pulses. The peak amplitude of the vertical antenna response is V, of loop number 1 is V_1, of loop number 2 is V_2. The elevation angle, θ, is calculated from the expression:

$$\sin\theta = \frac{Vh'}{(V_1 \cos\alpha - V_2 \sin\alpha)h}$$

where h' is the effective height of the loop antennas, and h is that for the vertical antenna. The polarization, P, of the downcoming wave, corresponding to the peak amplitudes of the ground-wave and for each of the sky-wave pulses, is given by the following expression:

$$P = \frac{E_\circ}{E}\;\frac{V_1 \sin\alpha + V_2 \cos\alpha}{V_1 \cos\alpha - V_2 \sin\alpha}\;\frac{(1 + R_g)}{(1 - R_g)}\;\frac{1}{\cos\theta}$$

where $\frac{1 + R_g}{1 + R_g}$ is an expression which takes into account the components of the wave that are reflected from the ground. Using the method outlined above, the polarization of sferics recorded about 500 km from the source were calculated. P for the ground-wave pulses was about 0.05 and for the first-hop sky-wave about 0.1 or 0.2. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3682. MACMILLAN, R. S., GOLDEN, R.M., AND RUCH, W.V.T., "A VLF Antenna for Generating a Horizontally Polarized Radiation

Field," National Bureau of Standards Symposium on the Propagation of VLF Radio Waves; 23-25 January 1957. ABSTRACT: The radiation field of a half-wave, horizontal, dipole antenna, located at the surface of an imperfect earth, have been calculated. The results of this calculation are as follows: (1) A horizontally polarized field is radiated in the plane normal to the center of the dipole; (2) A vertically polarized field is radiated along the axis of the dipole; (3) The vertically polarized field is zero in the plane normal to the center of the dipole. The nature of these fields have been verified experimentally. Finally, prior to the construction of a half-wave, VLF antenna, ground resistivity measurements were made at a number of locations in Central and Southern California. A correlation was made between these measured values and the geology of the terrain, leading to the development of a hypothesis concerning the relation between ground resistivity and certain features of the geological structure. (a-1, b-3, c-1, d-1, e-0, f-Description)

3683. FANTONI, J. A., AND BENOIT, R. C., JR., "Applying the Doppler Effect to Direction-Finder Design," Electronic Ind. Tele-Tech. vol. 16, pp. 75-77, 147; January 1957, pp. 66-67, 128; February 1957. ABSTRACT NO. 1: A circular array of fixed antennas is scanned in sequence to produce a direction-dependent phase. The IF from the receiver is applied to a discriminator and the resultant signal with scanning-switch modulation frequency of 42 cps is applied to a cr-tube bearing display. ABSTRACT NO. 2: The effect of a moving aerial is simulated by using a circular array of fixed aerials. By scanning them in sequence and comparing the phase angle differences between the sampled voltages the direction of transmission can be determined and plotted. (a_1-3, a_2-3, b-2, c-1, d-1, e-0, f-Description)

3684. LONGUET-HIGGINS, M. S., "The Statistical Analysis of a Random, Moving Surface," Phil. Trans. Roy. Soc. London, Series A, vol. 249, pp. 321-387; February 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Analysis)

3685. ANONYMOUS, "Direction Finder Set AN/TRD-15 (XE-1)," Servo Corporation of America, New Hyde Park, New York, Quarterly Progress Report No. 2, Report No. SCA-7500-RQ2; Contract No. DA 36-039-sc-72809, ASTIA No. AD-141 606; 1 February 1957. ABSTRACT: A direction finder set TRD-15 (XE-1) is to be developed. This D/F set covers the range of 1.5 to 20 mc with automatic cathode-ray presentation of visual bearings and employs the commutated fixed-antenna version of the circular-path Doppler D/F principle. Progress is reported on the refinement of the electrical and mechanical designs of the antenna switching transformer and the establishment of methods for the manufacture of the antenna switching transformer. A long line simulator to facilitate laboratory system test is described. Development of the data extraction circuits is reported. Design criteria were established for the limiter chain and FM detector. The spectrum-type rejection filter appeared to be generally sound. Further evaluation on high speed telegraph signals is needed. Results are presented of a human engineering evaluation of the electrical cabinet requirements. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3745)

3686. ANONYMOUS, "Antenna Study," Cubic Corporation, San Diego, California, Report No. AFMTC TR-57-17; Contract No. AF 08(606)785; ASTIA No. AD-124 140; 15 February 1957. ABSTRACT: A study was made to determine the optimum design of antennas for use in the ground-based Cotar VHF correlation tracking equipment and to explore antenna configurations which will permit operation of the Cotar with a smaller artificial ground plane. (Cotar uses interferometer techniques to measure 2 direction cosines from a ground-based antenna array to an airborne RF source.) Consideration was given to rays and waves, earth conductivity, space and surface waves, general theory, specific antenna theory, and polarization analysis. Results indicate that (1) the $\lambda/4$ monopole is the correct choice for the present; (2) the crossed slots and the annular slot have better radiation patterns but their susceptibility to elliptical polarization, via their nondirectional vector response, prohibits their use until the desired vector director response is ascertained at all elevation angles; (3) the required area of controlled earth conductivity is smaller than previously reported; (4) a prior knowledge of the "handedness" of the polarization vector is necessary for antenna types with other than linear polarization response; (5) communication between a linearly polarized pair of antennas may by non-existent for angles of disorientation other than 90°; (6) the inherent ellipticity of polarization from airborne vehicles in an aid to air-to-ground communication; and (7) the interception of power from an elliptically polarized wavefront by a linearly polarized antenna depends on the orientation of the wave ellipse but not on the direction of rotation of the wave vector. (See also AD-64 847, AD-110 778.) (a-3, b-3, c-1, d-1, e-0, f-Study)

3687. ANONYMOUS, "Radio Interference Filter F-312 (XW-1)/G," Andersen Laboratories, Incorporated, West Hartford, Connecticut, Final Report, Contract AF 30(635)2908, ASTIA No. AD-131 371; 15 February 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

3688. ARSAC, J., "Application of Mathematical Theories of Approximation to Aerial Smoothing in Radio Astronomy," Australian J. Phys., vol. 10, no. 1, pp. 16-28; March 1957. ABSTRACT: An aerial rarely provides a perfect image of a radio brightness distribution. If we consider an array as a filter of "spatial harmonics," the image function is a trigonometric sum approximating the object function. An application of mathematical theories shows the influence of the length and the shape of the array on the difference between object and image. Whatever the array, the image contrasts are bounded. The results provided by various arrays of the same length may be reduced by linear transforms. Inaccuracies of measurement, especially those due to the receiver noise, add to the systematic error due to the finite length of the antenna. We may try to get a compromise between these various causes of uncertainty. The most general effect of an aerial used to survey a radio brightness distribution (that we call "object" by analogy with optics) is to provide information on the object. All properly designed aerials having the same length provide the same quantity of information, but in a way more or less convenient to use. If we want the information to be directly available we use a narrow beam antenna. In fact, however, its design results from considerations about its radiation pattern. If we adopt criteria about the difference between object and image, we may design quite different antennae, better fitted to the problem of radio astronomy. If we have an imperfect antenna, to get the best from it, we may wish to extract from the given image all the information implicitly contained in it. It can be shown that all the images of the same object provided by aerials of the same length may be transformed one into the other by linear transformations. The choice of a criterion for the object-image difference allows determination of a transformation so that the obtained image agrees with this criterion. Interferometry, used as far as a distance L, gives the same information as an antenna of length L, but piece by piece. The combination of this information piece by piece according to a suitable process allows an image of the object to be formed. Again, the choice of a criterion for the object-image difference determined the process to be used. (a-1, b-1, c-1, d-11, e-0, f-Mathematical analysis)

3689. BARBER, N. F., "Correlation and Phase Methods of Direction Finding," NZJ Sci. Tech., Part B., vol. 38, pp. 416-424; March 1957. ABSTRACT NO. 1: A comparison of the two methods shows that their resolving powers are equal and their relative merits depend on the conditions of their application. ABSTRACT NO. 2: When a set of spaced detectors is used to study a system of progressive waves, the directional spectrum can be estimated through the correlation coefficients that obtain between the various signals. A better known technique combines the detectors into an array which has directional properties. These two methods of finding the directional spectrum are compared in principle. It is shown that their resolving powers are equal, but that the correlation method has certain advantages. (a_1-5, a_2-3, b-1, c-1, d-10, e-0, f-Comparison of method)

3690. BENOIT, R. C. AND COUGHLIN, F., "Development and Implementation of the Radio Direction Finder AN/CRD-6," U.S. Air Force, Air Research and Development Command, Rome Air Development Center, ASTIA No. AD 97-937. See also Department of Commerce PB134880; March 1957. ABSTRACT: In this report the performance and field implementation of the AN/CRD-5 are presented. Modifications brought about by operational deficiencies are covered as well as changes in the operational concept of the equipment. Descriptions and comparisons of equivalent and contemporary equipments are also given. (a-3, b-3, c-1, d-1, e-298, f-Performance report)

3691. BOHNERT, J. I., AND COLEMAN, H. P., "Applications of the Luneberg Lens," NRL Report 4888. See also Department of Commerce PB121809; March 1957. ABSTRACT: A number of significant attempts at fabrication of the Luneberg lens have been made both at NRL and elsewhere. Some of these attempts have resulted in lenses of practical applicability, if suitable limitations are accepted. A brief résumé of possible applications of the lens to problems in the field of microwave radar is given, and the state of the art regarding the fabrication of the lens is indicated. (a-3, b-3, c-1, d-1, e-0, f-Discussion)

3692. CARTER, P. S., "Study of the Feasibility of Airborne H.F. Direction-Finding Antenna Systems," IRE Trans., vol. ANE-4, pp. 19-23; March 1957. ABSTRACT: High-frequency (2-24 Mc/s) airborne direction-finding aerials are in general, limited in accuracy, due to the undesired coupling between the aerial and the airframe

which is electrically resonant in this frequency range. The results of laboratory and flight test studies of aerials designed to eliminate such coupling and to achieve the necessary direction-finding accuracy are described. The radiation patterns of one particular design---the wing H-Adock---are discussed. It is concluded that h/f airborne direction-finding is not feasible except in very restricted circumstances over narrow portion of the hf band. (a-1, b-1, c-1, d-1, e-0, f-Study)

3693. ECKART, G., "Errors in Radio Telemetry Due to Dielectric Turbulence in Troposphere," Zeit fuer Flugwissenschaften, vol. 5, no. 3, pp. 69-72; March 1957. ABSTRACT: The particular error problem as it affects range readings in navigational systems. If small disturbances of dielectric constant occur, range readings suffer from small errors. The estimate of the magnitude of these errors is made, based upon American measurements. (a-3, b-2, c-4, d-4, e-0, f-Analysis)

3694. HORNER, F., "Very Low-Frequency Propagation and Direction-Finding," Proc. IEE, Part B, vol. 104, pp. 73-80; March 1957. ABSTRACT: Studies of the propagation of 16 kc/s waves from the Rugby transmitter GBR have been made with the final objective of assessing the polarization errors to be expected in taking bearings on lightning flashes at similar frequencies. Measurements were made of the changes of the apparent bearing of the transmitter caused by changes in the amplitude and polarization of the ionospheric waves. A crossed-loop cathode-ray direction-finder was used for this work. Polarization errors were largest at distances of about 300 km from the transmitter, where median errors of the order of 10° in daylight and 30° at night were observed. Reasons are advanced for expecting rather smaller errors on a transient signal, such as an atmospheric, but the difference should not be statistically great. Conditions which lead to large errors on a c.w. signal, however, often produce such complex traces with atmospherics that a bearing cannot be read. This is particularly true at night, and common features of night-time observations are missed observations at one or more stations and sets of bearings from which no fix can be derived. A worth-while improvement in fixing accuracy might result from weighting the bearings according to the distance of the flash from each station. The measurements have yielded further information on the reflecting properties of the ionosphere at 16 kc/s. Variations in bearings taken simultaneously at two stations at similar distances from Rugby, but in different directions, indicated that there were significant differences in the propagation along the two paths. It has been concluded that the polarization of the waves reflected by the ionosphere depends on the azimuthal direction of the propagation path, and this may be the explanation of apparent disagreements between the results of previous workers. (a-1, b-1, c-1, d-5, e-676, f-Experimental results)

3695. LEPECHINSKY, D., "The Magneto Ionic Theory and Its Results," Ann. Telecommun., vol. 12, no. 2, pp. 60-70; February 1957. no. 3, pp. 74-91; March 1957. ABSTRACT: Not available. (a-4, b-2, c-3, d-3, e-0, f-Propagation theory)

3696. MIYA., K, SASAKI, T., ISHIKAWA, M, AND MATSUSHITA, S., "Direct-Vision-Type Direction Finder for High Frequency," Rep. Ionosphere Res. Japan, vol. 11, pp. 1-10; March 1957. ABSTRACT NO. 1: The bearing of an hf signal is indicated directly on a cr tube by a bright radial line at the corresponding angle. A sensitivity 40 db higher than that of conventional equipment is achieved by deriving the cr tube deflection voltages from the changes in the rectified output of a receiver when different antenna combinations are connected to its input in sequence. The high sensitivity permits directional observations on weak scattered signals. Circuit diagrams are given and sources of error are discussed. ABSTRACT NO. 2: Describes a direct-vision type direction finder with which either multiple or scattering signals can be measured. The principle of the finder is the so-called differential output method which is realized by using an electrical time-division system. The frequency range is 3-23 Mc/s and the minimum measurable field intensity is estimated at -27 to -40 dB above 1μV/m. The bearing of an incoming wave is indicated by a sharp unidirectional figure on a c.r.t. (a_1-5, a_2-3, b-1, c-6, d-6, e-0, f-Description)

3697. ANONYMOUS, "Automatic Position Plotting," Engineer, vol. 203, no. 5275, p. 344; 1 March 1957. ABSTRACT: System of triangulation of number of bearings in order to establish position of aircraft with negligible delay, installed by Royal Navy at Yeovilton near Glasgow; information derived from automatic direction finders normally installed at R N Air Stations. (a-3, b-2, c-1, d-5, e-0, f-Description)

3698. LOVEBERG. A. G., "An Experimental Investigation of a Quadrupole Antenna for High Frequency Direction Finding," Research and Development Report; Contract No. (NEL Report No. 742); ASTIA No. AD-149 835; 8 March 1957. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

3699. LOVEBERG, A. G., "Factors Affecting the Reliability of Calibration of Shipboard High Frequency Direction Finder Systems," Navy Electronics Laboratories, San Diego, California, NEL Report No. 743, ASTIA No. AD-140 976; 8 March 1957. ABSTRACT: Variations in high frequency direction finder (HF-DF) calibration were found to result from (a) changes in major shipboard structures; (b) tuned objects, such as communication antennas; (c) individual variations in conductivity of joints in elements of rigging, booms, etc.; and (d) movable structures, such as davits and guns. The variations caused by communication antennas were particularly severe. It was concluded that single-loop DF antennas cannot be calibrated reliably through the 2-to-30-Mc frequency range in a shipboard installation unless the entire shipboard environment is subject to rigid electrical control. In general, the degree of control required is not practicable and it appears that a new antenna with much less response to the scattered field is necessary to provide calibration reliability. (a-1, b-3, c-1, d-1, c-167, f-Analysis)

3700. COLONY, C.G., DOWNING, P.B., ET AL., "Direction Finder Set, AN/ALD-2(XN-2)," Crosley Division, AVCO Manufacturing Corporation, Cincinnati, Ohio, Final Report; Contract No. NOa(s) 54-671-c; ASTIA No. AD-156 997; 29 March 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3701. KOCH, G.F., "Directional Aerials with Apertures of Special Shapes," Nachrichtentech. Z., (NTZ), vol. 10, no. 4, pp. 175-186; April 1957. ABSTRACT: The side-lobe levels in the radiation pattern for one plane of aperture radiators can be made considerably smaller if apertures with other than retangular, round, or elliptical shapes are chosen. A description of rhombic reflectors designed for homogeneously illuminated radiators with specially shaped apertures is given. The radiation patterns for perpendicular and oblique incidence are given and the aperture efficiency for oblique incidence is discussed. The theory of inhomogeneously illuminated aperture radiators is outlined. Paraboloid reflectors having a cos-shaped aperture with offset feed and those with rotational symmetry are described in detail and two further paraboloid reflectors are mentioned as examples. The appendix contains an explanation of the theory for the calculation of reflections back into the feed caused by a homogeneously illuminated "substitute aperture" and of the horizontal radiation pattern for paraboloid reflectors with an offset feed. (a-2, b-2, c-4, d-4, e-0, f-Descriptive analysis)

3702. MACKINTOSH, J.E., "Comparative Trials on the U.H.F. Direction Finders Type X. 1340 and Type C.A.D.F. at Lasham," Royal Aircraft Establishment, Great Britain, Technical Note No. RAD. 681; ASTIA No. AD-145 782; April 1957. ABSTRACT: The results of a series of ground and flight tests on two direction finders are given in this Note. One of these direction finders used a conventional (i.e., narrow aperture) aerial whilst the other incorporated an aerial having an aperture of 1.2λ at the mid-point in the frequency band. The degree of improvement in site error suppression which can be expected in practice from the latter system is shown, together with figures for the instrumental and polarisation errors of the two equipments. Comparative figures are also given for both equipments using (a) dipole aerials, and (b) monopole aerials mounted on an elevated counterpoise. The effect of the counterpoise in improving the performance of both equipments at high angles of elevation is shown. Proposals for multichannel operation for both systems using a single aerial array are described and an estimate is included of the relative sizes of the production versions of each equipment. (a-1, b-3, c-1, d-5, e-9, f-Evaluation and comparison)

3703. MIYA, K., SASAKI, T., AND ISHIKAWA, M., "Angles of Arrival of a Very-High-Frequency Signal in Ionospheric Forward Propagation," Rep. Ionosphere Research Japan, vol. 11, no. 1, pp. 1-19; April 1957. ABSTRACT: A detailed description is given, with block and circuit diagrams, of D/F equipment operating not on a minimum method but on a differential-output method realised by means of an electrical time-division system. The aerial system consists of 5 vertical 6 m rods, four located at the corners and one at the centre of a square base, of diagonal 6 m, the diagonals being respectively in the N-S and E-W directions. The minimum measurable field-strength in the hf band is estimated as 27-40 dB below 1μV/m. The bearing of the incoming wave is indicated by a sharp unidirectional figure on the screen of a crt. Errors peculiar to the equipment are discussed theoretically. (a-3, b-1, c-6, d-6, e-0, f-Study and experiment)

3704. MIYA, K., "Direct-Vision Type Direction Finder for High Frequency," J. Inst. Elect. Commun. Engrs. Japan, vol. 40, no. 4, pp. 429-436; April 1957. ABSTRACT: A detailed description is given, with block and circuit diagrams, of D/F equipment operating not on a minimum method but on a differential-output method realized by means of an electrical time-division system. The aerial system consists of 5 vertical 6 m rods, four located at the corners and one at the centre of a square base, of diagonal 6 m, the diagonals being respectively in the N-S and E-W directions. The minimum measurable field-strength in the hf band is estimated as 27-40 dB below 1μV m. The bearing of the incoming wave is indicated by a sharp unidirectional figure on the screen of a crt. Errors peculiar to the equipment are discussed theoretically. (a-2, b-1, c-6, d-6, e-0, f-Description)

3705. WEEKS, W., "On the Estimation of Ferrite Loop Antenna Impedance," Antenna Laboratory Technical Report No. 17, University of Illinois, Contract No. AF 33(616)-3220; 10 April 1957. ABSTRACT: Approximate equations are developed which give the input impedance, quality factor and radiation efficiency for most of the small ferrite-loaded inductive antenna structures which might be met in practice. Ferrite losses are accounted for by employing a complex permeability. Illustrative examples and comparisons to measured values are presented and some useful data are included. (a-1, b-3, c-1, d-1, e-526, f-Analysis)

3706. ANONYMOUS, "Proposed Military Characteristics for Ground UHF Direction Finding System," Army Aviation Board, Fort Rucker, Ala., ASTIA No. AD-140 954; 11 April 1957. ABSTRACT: The required range of the ground UHF D/F system is from 225 to 399.9 mc. The equipment shall be capable of receiving and indicating accurate directional bearings on any type of signal transmitted by standard Army UHF airborne transmitters, such as the AN/ARC-55 radio set. The equipment shall be capable of satisfactory line-of-sight D/F operation against a transmitted signal from an ARC-55 radio set, or equivalent, at a line-of-sight range up to 100 naut mi. The equipment shall provide 360° azimuth coverage at elevations from zero to 75° above the horizon. The equipment shall provide interference rejection and anti-jamming effectiveness to the optimum extent compatible with the state of the art. No radio interference shall be generated by the equipment that will adversely affect receiving equipment in the immediate vicinity. The bearing accuracy of the equipment against a line-of-sight aircraft, when the set is employed in a substantially clear area, shall be at least ±5°, with ±2° bearing accuracy desired. The system shall be capable of taking bearings on transmissions of a 1-sec duration or less. Consideration should be given to an antenna using the doppler principle to obtain the desired accuracy. Other items which are considered are proposed service employment, functional requirements, background and/or related information, military value, physical characteristics, equipment operation and maintenance characteristics, and provisions for organizational maintenance in the field. (a-3, b-3, c-1, d-1, e-0, f-Specifications)

3707. TRAVERS, D.N., "Direction-Finder, Radio, Shipboard, Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Interim Development Report; Contract No. NObsr-64585; ASTIA No. AD-140 875; 26 April 1957. ABSTRACT: Work performed on the design and construction of a spinning spaced loop antenna for use with the AN/SRD-7 direction finder receiver is summarized. A test model is described which uses 6-inch diameter three-turn loops spaced 12 inches apart. Results of screen room performance tests to determine the antenna pattern and sensitivity are reported with photographs of D/F indicator patterns. Anticipated modifications to improve performance of the antenna are described. Further work toward the development of a reliable three-loop array phase shift amplifier and mixing circuit is described. Passive networks have been investigated and found to be unsatisfactory. Design and performance of an active network for selecting either simple loop or spaced loop response or any combination of the two is described. It is anticipated that this circuit will be used in a new version of the AN/SRD-7 remote antenna assembly to replace the existing model. The first model of the automatic calibrator is complete and available for use by the Navy at any time and location. The availability of a complete instruction manual describing necessary modifications to the DAQ, DAU, or AN/SRD-7 direction finders is reported. The status of development work on a second version of the automatic calibrator is briefly summarized, and it is anticipated that first tests may be performed by October of this year. It is also reported that a special two-frequency target transmitter required for this system will be completed and available by 30 June 1957. (a-1, b-3, c-1, d-1, e-0, f-Study report)

3708. JACOB, M., "The Development of Rhombic Short-Wave Aerials for Broad-Band Radiation," Bull. Assoc. Suisse Elect., vol. 48, no. 9, pp. 422-428, 445; 27 April 1957. ABSTRACT: The principle of operation and the more important parameters in the design of rhombic s.w. aerials are considered. To obviate the need for solving complex field equations a group of curves for some of the determining factors was evaluated; this permits a relatively quick computation of the aerials. A number of examples are worked out to illustrate the method. (a-2, b-1, c-4, d-13, e-0, f-Theory)

3709. ARSAC, J., AND SIMON, J.C., "Fluctuation Problems in Long Distance Propagation," Onde Elect., vol. 37, no. 362, pp. 495-497; May 1957. ABSTRACT: On the basis of an atmosphere containing scattering centres whose positions fluctuate stochastically, an expression is derived relating the auto-correlation function of the received field to the Fourier transform of the vertical velocity distribution with which the scattering centres move. It is stressed that the explanation of scatter propagation which depends on diffusion by atmospheric irregularities is by no means yet established to be valid. (a-3, b-2, c-3, d-3, e-0, f-Theory)

3710. BISHOP, A.F., "Frequency Propagation Caused by Severe Atmospheric Disturbances," Oklahoma A. and M. College, Stillwater, Oklahoma; ASTIA No. AD-129 7[illegible]; May 1957. ABSTRACT: The electrical conditions which characterize a tornado-bearing thunderstorm were studied as part of a research project on the possibility of electronically locating and tracking tornadoes. Results indicate that a pronounced shift from low frequencies to much higher frequencies occurs in the radiated electromagnetic energy when a tornadic situation develops within a thunderstorm. The number of cloud-to-ground lightning strokes (which radiate principally below 30 kc) is reduced and the number of inner-cloud strokes (whose radiations are generally above 80 kc) is greatly increased. A correlation exists between the intensity of a storm and the number of pips/sec recorded on HF equipment. Fifteen pips/sec is about the threshold for tornadic activity. When the number of pips/sec from a particular azimuth reaches 20 there is about 90% probability that a tornado exists or is being developed. See also AD-33 024, AD-111 551. (a-3, b-3, c-1, d-1, e-0, f-Study and analysis)

3711. BULLINGTON, K., "Radio Propagation Fundamentals," Bell Syst. tech. J., vol. 36, no. 3, pp. 593-626; May 1957. ABSTRACT: The engineering of radio systems requires an estimate of the power loss between the transmitter and the receiver. Such estimates are affected by many factors, including reflections, fading, refraction in the atmosphere, and diffraction over the earth's surface. Radio transmission theory and experiment in all frequency bands of current interest are summarized. Ground-wave and sky-wave transmission are included, and both line of sight and beyond horizon transmission are considered. The principal emphasis is placed on quantitative charts that are useful for engineering purposes. (a-1, b-1, c-1, e-0, f-Fundamental theory)

3712. DIEMINGER, W., "Experiments on Pulse Propagation at Oblique Incidence," Ann. Telecomm., vol. 12, no. 5, pp. 155-159; May 1957. ABSTRACT: The principal results of the investigations are shown graphically and discussed. Results obtained during the eclipse of June 30, 1954, for the F_1- and F_2-layer critical frequencies and for the oblique-incidence muf-values are also shown. A secondary result of the investigations is to prove that it is possible to observe, with sufficient accuracy, ionospheric phenomena produced above inaccessible places, by means of suitable experiments at oblique incidence. (a-3, b-2, c-3, d-3, e-0, f-Study report)

3713. HARRISON, C.W., "Qualitative Analysis of Loop Antenna Behavior in Linearly and Elliptically Polarized Electric Fields," Journal Amer. Soc. Naval Engineers, vol. 69, no. 2, pp. 369-374; May 1957. ABSTRACT: The measurement of the magnetic field associated with a linearly or elliptically polarized electric field, using a small loop, or magnetic probe, is discussed. It is shown that in general a loop will not measure the magnetic field faithfully because the sensing element responds to the antenna modes as well as the transmission line mode excited in the loop structure by the incident electromagnetic field. A special shielded loop with two gaps was invented to eliminate or reduce the effect of the antenna modes. It is anticipated that this device will be found useful in the field of direction finding. For many years loop antennas of rectangular or circular configuration have been employed for direction finding purposes. In operation, the plane of the loop is oriented vertically with respect to the surface of the earth, and the load impedance (or sensing element) is connected symmetrically in the loop at the top or bottom of the structure. This device may be used to measure the magnetic field associated with a vertically polarized electric field, provided complete structural symmetry obtains and there are no asymmetrically placed conductors or dielectrics in the vicinity of the loop. If the electric or magnetic field is ellipti-

cally polarized the correct bearing of a distant radio station cannot be obtained using a conventional loop. This phenomenon was termed "night effect" in the early days of direction finding technology. The primary purpose of the present paper is to discuss, in a qualitative yet electromagnetically correct way, some of the properties of several small loop types for measuring the linearly polarized magnetic field associated with an elliptically polarized electric field. (a-1, b-1, c-1, d-1, e-126, f-Analysis)

3714. SAIBEL, A. G., "On the Accuracy of Determining Position by Radio Navigation Methods," Radiotekhnika, Mosk., vol. 12, pp. 64-66; May 1957. ABSTRACT: Various methods for assessing accuracy are reviewed and compared on the basis of distribution functions of error probabilities. It is suggested that this accuracy should be characterized by the mean-square error in position. (a-5, b-1, c-2, d-2, e-0, f-Theory and comparative analysis)

3715. ANDERSON, M.E., AND DAVIS, D.W., "Latron Tube Development for AN/ARD-10 (XY-1)," Farnsworth Electronics Company, Fort Wayne, Indiana, Final Report, Contract No. AF 33(600)25523; ASTIA No. AD-150 437; 15 May 1957. ABSTRACT: A special CRT (Laton) was developed. The design approach was directed at a brightness level of not less than 250 ft-L when a cumulative writing time of 1 μsec has accrued. The indicator was to be designed for displaying a stored signal continuously for 1 min and provide controllable erasing time in the period of 1 msec to 1 min following storage. Deflection time required for a 1-in. deflection of the spot was not to be greater than 0.25 μsec. The indicator was to permit resolving 25 adjacent spots/mil on any line through the center of the display area. Nearly complete elimination of the bright spots and bright rim resulted in improved visual presentation during normal operation of the completed tubes. The off-axis writing gun tube and the ring-flooding gun tube were successfully developed. Silicon monoxide as the insulator material proved satisfactory. The use of Aquadag wall-coating material resulted in satisfactory tubes, but difficulty was experienced in the processing stage. Blotches were observed to form on the tubes after 300 to 1500 hr of operation, depending upon the particular lot of Aquadag used. A filamentary gettering process was developed which proved successful in cleaning up several tubes with poor vacuums. The flooding system of several tubes was satisfactory after several thousand hours of continuous testing. (a-3, b-3, c-1, d-1, e-0, f-Development report)

3716. ATKINSON, E. J., "Antenna AS-(XA-122)/ARN-6," Bendix Radio Division, Bendix Aviation Corporation, Baltimore, Maryland, Report No. 467-1182-148; Contract No. AF 33(600)26605, ASTIA No. AD-139 372; 15 May 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3717. ANONYMOUS, "Dead Reckoning Navigator, Automatic, Radio Corrected," Lear, Inc., Santa Monica, California, Quarterly Report No. 2; Contract No. DA 36-039-sc-72798, ASTIA No. AD-138 180; 25 May 1957. ABSTRACT: A dead-reckoning navigator, automatic radio corrected, is to be developed. The proposed system consisted of the ADF (radio) computer, a dead-reckoning computer, a comparator, and a data weighting unit. The final system possessed the following characteristics: (1) the ADF tracking loop and computer separate from the dead-reckoning computer; (2) the velocity memory present in the ADF tracking loops; (3) challenge and restraint of information supplied to the dead-reckoning computer from the ADF computer; (4) the initial servoing of ADF antennas to the best conceived locations of the radio station transmitting sites; (5) simplified trigonometrics of the ADF computer; and (6) optimum system design for the application of data filtering and weighting techniques. Modifications to the system block diagram included the establishment of scale factors and the elimination of wind read-out. Preliminary design system simulation and the statistical analysis of wind variations were completed. The proposed form of data weighting function considers the anticipated variation in ADF error with range; all phases of data weighting are subject to revision during flight test. Circuit design is described for the following units; the servo, precision summing, and quadrature-stripping amplifiers; and the data weighting unit. A new ground track, heading and bearing-to-destination indicator was developed. See also AD-118 896. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3718. HERMAN, J., "Characteristics of Thin Wire Loop and Biconical Antennas with Spherical Ferrite Core," IRE-URSI Symposium; 22-25 May 1957. ABSTRACT: The problem of radiation from a thin wire loop antenna in air and with a finite spherical core of material other than air has been solved quite rigorously. The solution holds for any diameter loop, any frequency, and for any core material including losses whose characteristics are homogeneous and isotropic, including air. Expressions for input impedance, radiated power, and efficiency of radiation, have been derived. A particular ferrite has been used for experimental check of the theory. A ball 3-1/4 inches diameter with a thin silvered loop was fabricated and input impedance from 90 to 250 mc was measured. Results were in good agreement. As predicted the use of ferrite effectively increases electrical size of antenna. Conclusion is that development of better materials will make the use of ferrites notably advantageous in transmitters and receivers. (a-5, b-1, c-1, d-1, e-0, f-Description)

3719. ADACHI, S., AND MUSHIAKE, Y., "Theoretical Formulation for Circular Loop Antennas by Integral Equation Method," Sci. Rep. Res. Inst. Tohoku Univ., Ser. B., vol. 9, pp. 9-18; June 1957. ABSTRACT: An integral equation for the current distributions in a loaded circular loop antenna is solved by the successive approximation method, thus leading to expressions for the transmitting and receiving characteristics of a loaded or short-circuited loop antenna at HF. (a-3, b-1, c-6, d-6, e-0, f-Mathematical analysis)

3720. AMMERMAN, C.R., BLAIR, W.L., ET AL., "Study on Advanced Electronic Ferret Reconnaissance System," Haller, Raymond and Brown, Incorporated, State College, Pennsylvania, Final Report, Contract AF 33(616)3545; ASTIA No. AD-156 729; June 1957. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

3721. AUBRY, J., "Assessment of R.A.N.A. Hectometric Radio Navigation Systems," Onde. Elect., vol. 37, no. 363, pp. 571-585; June 1957. ABSTRACT: Evaluation of operation based on phase comparison method; ground absorption and interferential effect of ground irregularities affect precision of system. From the analysis of this interference, certain conclusions can be derived regarding R.A.N.A. network calibration. The system accuracy can also be assessed directly from continuous receiver readings. (a-3 and 4, b-2, c-3, d-3, e-0, f-Evaluation)

3722. BAILEY, A.D., AND WAVERING, A.J., "Separate Channel Averaging in a Matched Twin-Channel Radio Direction Finder," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 8, Contract No. 1834(02); June 1957. See also Department of Commerce PB135119; ASTIA AD-138 183. ABSTRACT: Evidence is provided that proper sampling and averaging of the data of the separate channels in a matched twin-channel radio direction finder will eliminate the need for a bearing shifter. Theoretical proof is given that the separate channel averaging system contributes the same order of error from wave interference as existing systems, provided certain conditions are satisfied. Experimental results bear out the theoretical findings in most cases. The complexity of the sampling technique and the experimental accuracy of the system are also discussed. (a-3, b-3, c-1, d-1, e-0, f-Report. Extension of paper with same title presented at the 1956 National Electronics Conference. See Abstract Nos. 3636 and 3528)

3723. BANDYOPADHYAY, P., "Models of the Lower Ionosphere as May Be Inferred from Absorption Results," Indian J. Phys., vol. 31, no. 6, pp. 297-308; June 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-8, e-0, f-Study)

3724. LEIFHEIT, S., "Evaluation of Electrical Earth Constants," Electrical Engineering Research Lab., University of Illinois, Urbana, Illinois, Technical Report No. 7; Contract No. Nonr-183402; ASTIA No. AD-137 654; June 1957. ABSTRACT: Suitable methods for the evaluation of electrical earth constants are reviewed, and a general method for determining depth of burial for cables entering a HF radio direction finding site is presented. The following methods are considered adequate for determining the effect of the ground on fields above the surface: (1) wave attenuation measurements, (2) wave tilt methods, (3) capacitor-reactance methods (soil sampling), (4) wave reflection methods, (5) geologic estimates, and (6) UHF measurements. The soil sampling and geologic estimate methods are considered the most useful for determining fields below the surface. Soil sampling and moisture data can be used to provide information about such things as seasonal variation of ground constants, variation of ground constants with soil type, etc. Results of calculations of the depth of signal penetration in soil over various ranges of the conductivity, dielectric constant, and frequency are given. Presentation is made of a bibliography of existing literature on the evaluation of earth constants. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3725. MITRA, S.N., "Solar Eclipse of 30th June 1954 and Its Effect upon the Ionosphere," Indian J. Phys., vol. 31, no. 6, pp. 309-323; June 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-8, e-0, f-Observation)

3726. SCHROEDER, C.A., LOONEY, C.H., AND CARPENTER, H.E. "Project Vanguard Report No. 18-Minitrack Report No. 1 - Phase Measurement," NRL Report 4995. See also Department of Commerce PB131220; June 1957. ABSTRACT: The "Minitrack" system for tracking an artificial earth satellite, which has been developed as a part of Project Vanguard, is described briefly, and the phase measurement portion of this system is described in detail. (a-3, b-3, c-1, d-1, e-0, f-Description)

3727. DELIT, M., DENITTIS, G., ET AL., "A Study of Automatic Signal Selection for Airborne Direction Finders," New York University College of Engineering, New York, Interim Report No. 3, Contract No. DA 36-039-sc-72806; ASTIA No. AD-149 175; 15 June 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study)

3728. BATES, J.K., BENOWITZ, R., ET AL., "Airborne Electronic (Ferret) Reconnaissance System," Federal Telecommunication Laboratories, Nutley, New Jersey, Interim Report No. 10; Contract AF 33(600)27521; ASTIA No. AD-138 413; July 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3729. BERMAN, A., AND CLAY, C. S., "Theory of Time Averaged Product Arrays," J. Acoust. Soc. Am., vol. 29, no. 7, pp. 805-812; July 1957. ABSTRACT: The mathematical analysis of the directional characteristics of linear additive arrays is given in a polynomial representation. The result of multiplying and taking a time average of the outputs of several detectors also has directional characteristics that may be expressed as polynomials. It is shown that the same directional characteristics may be obtained from multiplicative arrays having a small number of detectors as with an additive array with a large number of elements. The length of the multiplicative array is about half the length of the additive array having the same directional characteristics. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3730. CLARKE, C., "DF Aerial System for Decimeter Wavelengths," Electronic Radio Engineer, vol. 34, no. 7, pp. 238-245; July 1957. ABSTRACT: The development of two aerial systems, suitable for direction finding on vertically and horizontally-polarized waves respectively, is described. They are designed for a twin-channel cathode-ray type of instrument in which the azimuthal coverage is limited to a selected 90-degree sector, thereby giving unambiguous bearings, improved sensitivity and reduction of site errors. Both systems comprise two aerials each combined with a flat-sheet reflector, mounted above a circular earth-plane and oriented approximately at right angles. Cone monopoles are used for vertical polarization and flat, circular-disk dipoles for the horizontal system. Each system has wide-band impedance characteristics and over the band 500-1000 Mc/s the v.s.w.r. on the aerials and feeders is never less than 0.3. The complete D/F has not been developed but the probable direction-finding performance of such an instrument, using the aerial systems described, has been estimated. For vertically- or horizontally-polarized signals, received on their appropriate system, azimuthal errors should not exceed ± 5 degrees in the 90-degree sector. By rotating the aerial system to the equi-signal position the errors should be much smaller. For waves of mixed polarization, the horizontal system should have negligible polarization error but the vertical system may have large errors, depending upon the type of aerial used. (a-1, b-2, c-1, d-5, e-0, f-Description)

3731. PIDHAYNY, D. D., "Survey of Airborne Electronic Countermeasure Equipments," Thompson Ramo Woolridge Inc., Report No. RW 1661.71, ASTIA No. AD-326 151; 1 July 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3732. CARBENAY, F., "Calibration of Narrow-Sector Radiogoniometers for Atmospherics," Comptes. Rendus Acad. Sci., vol. 245, pp. 298-300; 17 July 1957. ABSTRACT: An extension of the method of calibrating omnidirectional recording receivers with reference to signal flux and effective antenna height. (a-3, b-1, c-3, d-3, e-0, f-Description)

3733. BRYANT, W. D., "Recessed Radio Compass Antenna System Development," Magnavox Company, Fort Wayne, Indiana, Report No. 61656-C, Contract No. AF 33(700)30860, ASTIA No. AD-137 595; 19 July 1957. ABSTRACT: A flush-cavity sense antenna of small effective-height was designed which will allow satisfactory radio compass operation when used with a modified AN/ARN-6 receiver. The modified system was designed so that the sense antenna with an effective height of only 0.032 m may be located up to 45 ft from the receiver. The antenna circuit is optimized for 1, 2, or 3 standard 15-ft lengths of sense cable. Satisfactory operation was realized in compass function at all frequencies in a field of 40µv/m with the 0.032-m effective-height antenna. The use of a 15-ft sense cable improved antenna sensitivity on all bands. The 45-ft sense cable, when used with the modified receiver, resulted in a maximum degradation of antenna sensitivity at the low ends of the bands of 2.1 db over that of the unmodified ARN-6 receiver and provided an increase in sensitivity at the high ends of the bands ranging from 5.4 to 8.8 db. The loop antenna MGX 708107-2 is interchangeable with the AS-313B/ARN-6 loop antenna, but occupies less space, and is approximately 50% lighter. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3420)

3734. ANONYMOUS, "ARD-10(XY-2) and ARR-54(XY-1)," Farnsworth Electronics Company, Fort Wayne, Indiana, Interim Report, Contract No. AF 33(600)25523; ASTIA No. AD-157 419; 20 July 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3735. TRAVERS, D. N., AND MOORE, J. D., ET AL., "Direction-Finder, Radio, Shipboard, Siting and Design, Study, and Development," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. 64585, ASTIA No. AD-141 609; 26 July 1957. ABSTRACT: Completion of construction details at the D/F building and tower is described briefly. The small spaced loop antenna which has been designed for operation with the AN/SRD-7 has been tested under various conditions. This testing is summarized and the needed improvements are discussed. Successful operation in the field with a distant transmitter using vertical polarization has been accomplished with some pattern distortion. Construction of the small three loop array has not as yet been started since some details of the spaced loop portion remain to be modified for improved performance. Testing of the large three-loop array with a reradiator has been accomplished at one frequency to show the degree of improvement of a three-loop array over a spaced loop, and the latter over a simple loop. For test condition, an error of 25° in a simple loop was reduced to 12° in the spaced loop and 0° in the three loop array. Photographs of the antenna patterns are included. Details of the mixing circuit design are also discussed. Latest development of the automatic calibrator is described in detail. The automatic true bearing circuit for the calibration by substitution method is now ready for testing. A possible method for making certain reradiation studies in a screen room is described with the results of preliminary tests. (a-1, b-3, c-1, d-1, e-1000, f-Study report. See Abstract No. 3707)

3736. ANONYMOUS, "Automatic Visual Direction-Finder," Mar. Engr. and Naval Architect, vol. 80, no. 971, p. 285; August 1957. ABSTRACT: Electronic navigational aid developed by International Marine Radio Co. to overcome difficulties of aural-null types; output from each loop aerial is connected respectively to channels of twin channel receiver; separate amplification and frequency reduction of each loop takes place; final voltages of 62 kc/sec are applied to 6 in. cathode ray tube to produce trace on screen; gyro repeater scale may be added outside relative scale for reading true bearings. (a-3, b-2, c-1, d-1, e-0, f-Description)

3737. ANONYMOUS, "Instruction Book IV, Type LPA-70( ) Flush Loop Antenna," Bendix Radio; August 1957. ABSTRACT: This paper described a crossed ferrite bar antenna operating in the simple loop mode. A cylindrical ferrite rotor is located at the center of the crossed bars for azimuth scanning. (a-4, b-3, c-1, d-1, e-0, f-Instruction manual)

3738. BAUR, K., "Phase Distortion Due to Ground Inhomogeneities," Nachr-Tech., vol. 10, pp. 385-389; August 1957. ABSTRACT: Formulas are derived for assessing the quality of the ground with regard to fluctuations of conductivity and dielectric constants, thereby assisting in the selection of a site suitable for D/F. (a-5, b-2, c-4, d-4, e-0, f-Mathematical analysis)

3739. KRONJAEGER, W., MARK, E., AND VOGT, K., "Investigations on the Large Rhombic Aerial at the Eschborn Transatlantic Radio Station," Nachrichtentech. Z. (N. T. Z.), vol. 10, no. 8, pp. 382-384; August 1957. ABSTRACT: The angle of radiation of the standard aerial employed for the radio link with North America changes from 36° to 10° in the frequency band 5 to 20 Mc/s whereas the angle of propagation in the same band, changes from 18° to 7° only. The aerials described are intended to compensate for the difference between the two angles which is particularly large at night frequencies (below 10 Mc/s); they are identical with those installed in 1954 by the British Post Office and the American Telephone and Telegraph Company (A. T. T.). Aerial gains of about 15 dB in the band 5 to 7.5 Mc/s obtained at Eschborn agree well with those recorded on aerial installations for the London---New York radio link. (a-2, b-2, c-4, d-4, e-0, f-Study and analysis)

3740. WAIT, J. R., "Insulated Loop Antenna Immersed in a Conducting Medium," J. Res. National Bureau of Standards, vol. 59, pp. 133-137; August 1957. ABSTRACT: A solution is given for the fields of a circular loop in a conducting medium. The loop is assumed to have a uniform current, and it is enclosed by a spherical insulating cavity. The impedance of the loop is also considered. It is shown that the power radiated from the loop varies approximately as the reciprocal of the radius of the cavity for a specified loop current. Furthermore, if the cavity is electrically small, relative to the external medium the radiation field is not significantly affected by the presence of the cavity. (a-1, b-1, c-1, d-1, e-318, f-Theory)

3741. ZIEHM, G., "Current Distribution on Vertical, Cylindrical Reflectors," Frequenz, vol. 11, no. 8, pp. 233-243; August 1957. ABSTRACT: Analysis of special problems arising, especially on ships, when direction finding antenna equipment is mounted on mast of length comparable to quarter wave; computation of magnitude and distribution of vertical current for useful frequency coverage; practical suggestions. (a-3, b-2, c-4, d-4, e-0, f-Analysis)

3742. ANONYMOUS, "Eleuthera Cotar System," Cubic Corporation, San Diego, California, Final Report; Contract AF 08(606)785, ASTIA No. AD-147 961; 9 August 1957. ABSTRACT: Units of the Cotar system were designed, fabricated, and factory-tested. The equipment is designed to produce VHF angle measuring equipment capable of supplying recorded cosine date describing the angular position of a VHF signal source relative to a previously determined point on a system of baselines. Test equipment was also designed and fabricated. Data are given on the development of the following components; antennas, RF heads and receivers, the double local oscillator assembly, 1000-c frequency standard, servo control units, servo gear trains, power supplies, RF distribution system, digital data-handling equipment, and analog coordinate converter. A discussion is also presented of field tests performed at the Kearny Mesa test site. The appendix contains a derivation of systematic errors. (a-?, b-3, c-1, d-1, e-0, f-Report. See Abstract No. 3512)

3743. ROCK, P., "Pre-B58 Flight Test Program, Phase II, Volume V. Direction Finding Accuracy and Location," Melpar, Incorporated, Falls Church, Virginia, Contract No. AF 33(038)21250, ASTIA No. Ad-153 114; 15 August 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3744. ANONYMOUS, "Direction Finder System AN/TLQ-8 (XW-1)," Ramo-Wooldridge Corporation, Los Angeles, California, Report No. RW 1631.88, Contract No. AF 30(602)1532, ASTIA No. AD-131 286; 20 August 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3745. RICHTER, F., "Direction Finder Set AN/TRD 15 (XE-1)," Servo Corporation of America, New Hyde Park, New York, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-72809, ASTIA No. AD 156 199; 20 August 1957. ABSTRACT: The design of a quasi-Doppler direction finding system for the HF region of 1.5 to 20 Mc is influenced by many interlocking factors. In the period covered by this report, January 1, 1957 to June 30, 1957, these factors were investigated both in the laboratory and in extensive field testing. This work has resulted in the establishment of both general design criteria for the quasi-Doppler system and practical parameters for the AN/TRD-15. The results of laboratory and field tests are summarized in this report. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3685)

3746. ROESSLER, E., "The Latest Developments in Radio Navigation in Aeronautics," Electrotech. Z., Edition B, vol. 9, pp. 335-339; 21 August 1957. ABSTRACT: Modern aids to navigation are described and attempts to develop more universal systems are discussed. Thirty-three references. (a-5, b-2, c-4, d-4, e-0, f-Survey and bibliography)

3747. ANONYMOUS, "Dead Reckoning Navigator, Automatic, Radio Corrected," Lear, Incorporated, Santa Monica, California, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-72798, ASTIA No. AD 148 197; 25 August 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

3748. ANONYMOUS, "Two Doppler Navigators," Brit. Commun. Electronics, vol. 4, pp. 551-553; September 1957. ABSTRACT: Brief details of airborne equipments for use by military and commercial aircraft. (a-5, b-2, c-1, d-5, e-0, f-Description)

3749. ADACHI S., AND MUSHIAKE, Y., "Directive Loop Antennas," Rep. Res. Inst. Elect. Commun. Tohoku Univ., Series B, vol. 9, no. 2, pp. 105-112; September 1957. ABSTRACT: A short-circuited circular loop aerial of about one wavelength-circumference is investigated as a new type of directive aerial. A single loop, a folded loop and a directive loop with a reflecting plane and a director are developed. These aerials have the maximum radiation of linearly polarized waves in the axial direction of the loops. Various characteristics, namely radiation pattern, gain, and input impedance are investigated experimentally and theoretically based on the fundamental studies presented in the preceding paper. As a result, directive loop aerials of these types are found to have practical applications because of their respective advantages, such as high gain, wideband characteristics and mechanical compactness. (a-1, b-1, c-1, d-6, d-0, f-Theory)

3750. ADACHI, S., AND MUSHIAKE, Y., "Studies of Large Circular Loop Antennas," Rep. Res. Inst. Elect. Commun. Tohoku Univ., Series B, vol. 9, no. 2, pp. 79-103; September 1957. ABSTRACT: Large circular loop aerials are theoretically and experimentally studied by following the fundamental formulations which were presented in a previous paper (Sci. Rep. Res. Inst. Tohoku Univ., Series B, vol. 9, no. 1; 1957). Various characteristics such as current distribution, input impedance, radiation pattern, and power gain are calculated in the first order approximation. Some practicable experiments are performed and compared with theoretical results. Considerable agreement is found between them. The analogy between a circular loop aerial and the usual transmission line in connection with current distribution and equivalent characteristic impedance is discussed. Input impedance of a loaded loop aerial, image impedance and propagation constant of a loop aerial when considered as a four-terminal network, and load impedance for a travelling wave type loaded-loop aerial are also calculated and discussed. (a-1, b-1, c-1, d-6, e-0, f-Theory and experiment)

3751. RAO, S. B., "Terminated Circular Loop Aerial," Electronic Radio Engr., vol. 34, no. 9, pp. 347-350; September 1957. ABSTRACT: The radiation field at any point in space due to a terminated circular loop aerial of any radius is derived for free space conditions, assuming an unattenuated travelling wave along the loop. The theoretical relative field intensity pattern in the plane of the loop has been verified experimentally for cases where the circumference of the loop is less than a wavelength. (a-2, b-2, c-1, d-5, e-0, f-Theory)

3752. EASTON, R. L., "Project Vanguard Report No. 21, Minitrack Report No. 2 - The Mark II Minitrack System," NRL Report 5035, Department of Commerce 131330; September 1957. ABSTRACT: A Mark II Minitrack system, based on the interferometer principle in like manner to the primary system, has been developed, and this will permit amateur volunteer groups to spot and measure the track of the in-flight satellite. This document presents all the aspects of the design, construction, and calibration of the Mark II system for the serious-minded amateur desiring to carry out radio observations of the satellite. (a-3, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 3726)

3753. GREGORY, J. B., "The Relation of Forward Scattering of Very High Frequency Radiowaves to Partial Reflection of Medium Frequency Waves at Vertical Incidence," J. Geophys. Research, vol. 62, no. 3, pp. 383-388; September 1957. ABSTRACT: A comparison is made between published VHF forward-scatter data and results of vertical-incidence investigations of the lower ionosphere, mainly at a frequency of 1.75 Mc/s. The received waves in each type of transmission are shown to have many similar characteristics, such as temporal variations, and to originate in the same height regions. It is concluded that the two types of transmission have a common origin. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3754. HARRINGTON, R. F., "On The Gain and Beamwidth of Directional Antennas," Syracuse University Research Institute, Syracuse, New York, Contract AF 30(602)1640, ASTIA No. AD-131 386; September 1957. ABSTRACT: The problem of gain relationship is formulated in a manner similar to that used by L. J. Chu (J. Appl. Phys., p.1163; December 1948). Relationships are derived for gain to antenna size and beam width vs side lobe level. (a-3, b-3, c-1, d-1, e-0, f-Analysis)

3755. MIYA, K. M., ISHIKAWA, AND KANAYA, S., "On the Bearing of Ionospheric Radio Waves," Rep. Ionosphere Research Japan, vol. 11, no. 3, pp. 130-144; September 1957. ABSTRACT: A new visual and recording type of direction finder was used to investigate the fluctuations and remarkable lateral deviations of the bearings of

incoming long-distance hf signals. The results obtained are shown in numerous graphs. The fluctuation of bearing is found to be closely related to the mode of propagation. The lateral deviation characteristics under conditions of back scattering, continental forward scattering, and antipodal propagation are illustrated and discussed. (a-3, b-1, c-6, d-6, e-0, f-Theory)

3756. ZIEHM, G., "Symmetry Requirements for Cables in Two-Channel Direction-Finder Installations," Frequenz, vol. 11, no. 9, pp. 287-294; September 1957. ABSTRACT: In modern practice the cables between the direction-finder aerial and the receiver are well screened and balanced with respect to earth. When these cables, in a two-channel installation (Watson-Watt or Bellini-Tosi system), differ electrically in length by an amount comparable with $\lambda/4$ of the operating frequency, there will be variations in the apparent bearing and blurring of signal minima will take place. The results show that, over a large frequency band, good bearing accuracy is achieved when the system is matched (vswr < 2:1) and the electrical length of cables held with $\Delta\beta l < 0.04$ (in the usual notation). (a-2, b-2, c-4, d-4, e-492, f-Description)

3757. KLUG, S. H., KOCH, R. F., ET AL., "Unattended Electronic Ferret Reconnaissance Set AN/DLD-2 (XA-1)," Airborne Instruments Laboratories, Incorporated, Mineola, New York, Interim Report, Contract No. AF 33(600)32145, ASTIA No. AD-145 929; 3 September 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3758. CLARK, C., "Motion of Sporadic - E Patches Determined from High Frequency Backscatter Records," Radio Propagation Laboratory, Stanford University, Technical Report No. 24; 18 September 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

3759. STEELMAN, K. C., AND STONE, W. G., "Sferics Locating System AN/FMS-3 (V)," Army Signal Engineering Labs., Fort Monmouth, New Jersey, Engineering Report No. E-1215, ASTIA No. AD-145 861; 18 September 1957. ABSTRACT: Sferics Locating System AN/FMS-3 (V) consists of three or more outlying stations, arranged on baselines of 500 to 1500 miles, and a central plotting station. Each of the outlying stations in the network receives the sferics signals and resolves the azimuth angle of arrival. The stations, with the aid of a scanner unit, convert this azimuth data to a linear time period. This period of time is proportional to the azimuth angle. This method of representation lends itself to presently well-developed means of conversion to a code for transmission purposes. The code modulates a low frequency carrier which is transmitted over an ordinary telephone line or a radio link using a modified code, to a central station. The transmitting equipment is capable of handling azimuth data at the rate of 100 components per second. At the central plotting station the coded azimuth data from each outlying station is decoded and restored to a time lapse pulse. An automatic plotter computes the azimuth angle from each decoded azimuth data and plots the bearing lines, or their intersections, on a 12-inch cathode ray tube. With the aid of an overlay map, the center of rotation of each bearing line is preadjusted to correspond to the geographical location of its originating station. The intersection of these lines is the origin of the storm area. (a-1, b-3, c-1, d-1, e-0, f-Description)

3760. BAILEY, A. D., "An Application of the Principle of Least Squares in Automatic Radio Direction Finding," Proc. Nat. Electronics Conf., vol. 13, ASTIA AD-215 559, pp. 715-727; October 1957. ABSTRACT: Simple automatic bearing read-out devices that have been constructed to replace the human observer function in automatic bearing indicator or spinning goniometer type radio direction finders perform satisfactorily under near ideal cw propagation conditions. However, if the arriving radio signal is coded or otherwise interrupted, subject to wave interference effects due to multi-mode propagation, or to any one of the several types of noise interference, the simple bearing read-out system fails because of the many ambiguities that arise. A theoretical and experimental study of the application of one correlation technique - principle of least squares - to the problem of fitting an ideal indicated bearing pattern to the distorted and/or fragmentary bearing pattern that is actually observed under the above conditions is given. The fitting is done electrically. The procedure has considerably broader application than in the particular instance under study. It would apply to many instances of replacement of a human observer by an automatic device wherein the desired operation is that of fitting a distorted periodic function to its parent function. (a-2, b-1, c-1, d-1, e-0, f-Mathematical analysis)

3761. BAISER, M., "Some Observations on Scattering by Turbulent Inhomogeneities," IRE Trans., vol. AP-5, no. 4, pp. 383-390; October 1957. ABSTRACT: Several topics in the theory of radiowave scattering by dielectric inhomogeneities due to turbulence are discussed. A corrected derivation of the scattering formula is presented (which does not change the result), using the proper dyadic Green's function and examining the terms in the wave equation caused by the nonvanishing divergence of the scattered field. The statistics (distribution and correlation functions) of the received signal are considered. In particular, the significance of the space correlation function in testing some theoretical results is questioned. It is suggested that the frequency dependence of the time correlation function may give more information about the nature of the turbulence. (a-1, b-1, c-1, d-1, e-0, f-Observations)

3762. DRACHEV, L. A., AND BEREZIN, YU. V., "Influence of Large Irregularities of the F2 Layer on the Reflection Coefficient of Radio Waves," Radiotekhnika i Elektronika, vol. 2, no. 10, pp. 1234-1239; October 1957. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-Theory)

3763. DUBROVIN, V., "Observation of Artificial Earth-Satellite Signals. Work with the Direction-Finding Attachment," American Meteorological Society, Boston, Massachusetts, Contract No. AF 19(604)1936, ASTIA No. AD-161 719; October 1957. ABSTRACT: The equisignal zone method of determining the moment of passage of a satellite across the meridional plane was verified in the field. Major equipment used consisted of an ultrashortwave receiver, an oscillograph (EO-7), a tape recorder (MAG-8), antennas, and a direction-finding attachment. A transmitter for imitating satellite signals was installed in an airplane and flown in the region of the observation point. As the plane approached the observation point, the signal levels of the 2 antennas became less noticeable. When the plane passed through the equisignal zone the signal level difference completely disappeared. (a-3, b-3, c-1, d-1, e-0, f-Description)

3764 KEARNEY, J. W., "Unattended Electronic Ferret Reconnaissance System AN/DLD-1 (XA-1)," Airborne Instruments Laboratories, Incorporated, Mineola, New York, Quarterly Report, Contract No. AF 33(600)26730, ASTIA No. AD-146 077; October 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3765. KRONJAGER, W., AND VOGT, K., "The Behavior of Two Concentric Rhombic Aerials," Nachrtech. Z., vol. 10, pp. 494-496; October 1957. ABSTRACT: Measurements of coupling factor, matching, and gain of two rhombics, one of which is placed inside the other, show that the influence of the loaded outer antenna on the inner is negligible. The installation discussed is used for reception in a 4:1 range of frequencies, each antenna covering a range of 2:1. (a-3, b-2, c-4, d-4, e-0, f-Analysis)

3766. LONGUET-HIGGINS, M. S., "Statistical Properties of an Isotropic Random Surface," Phil. Trans. Roy. Soc., Series A, vol. 250, pp. 157-174; October 1957. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Statistics)

3767. STEELE, K. A., "Test Coupling Antennas for Alignment of UPD-501 System," Radio and Electrical Engineering Division, National Research Council of Canada, Report No. ERB-449, ASTIA No. AD-152 680; October 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

3768. BRENNER, E., "Frequency Spectra for Pulse Type Waveforms," Electronic Design, p. 28; 1 October 1957. ABSTRACT: When aperiodic pulses are impressed on a linear network, Fourier methods can be used provided the continuous rather than the line spectrum analysis is employed. Although the integral relationship which defines such continuous spectra is generally quite complicated, the analysis of a single rectangular pulse yields a wealth of information about the design of pulse type systems. A single, nonrecurrent pulse cannot be resolved into a Fourier series. Also, when pulses in a sequence have a slow repetition rate compared to the duration of each pulse, the use of Fourier series is not convenient. This is because the problem encountered in response calculations is essentially that of a "repeated transient." The transient associated with one pulse may have "died out" by the time the next pulse occurs. The design of circuits which are to be excited in this manner should, therefore, accommodate a single pulse or a train of pulses which is finite and nonperiodic. Frequency response (i.e., "steady state") methods can be used for this purpose if the continuous spectrum rather than if the Fourier series is used. (a-1, b-2, c-1, d-1, e-0, f-Analysis)

3769. HOUGARDY, H. H., AND YARU, N., "Annular Slot Direction-Finding Antenna," Hughes Aircraft Company, Culver City, California, Scientific Report No. 16, Contract No. AF 19(604)1317, ASTIA No. AD-133 782, 1 October 1957. ABSTRACT: The radiation characteristics were determined for a flush-mounted, cardioid-pattern, D/F antenna. By using the general equations for a far field of an annular slot in an infinite and perfectly conducting ground plane, expressions are derived for the radiation field of an antenna consisting of a single annular slot fed with a cylindrical waveguide excited with 2 orthogonal TE_{11} modes and the TEM mode. The antenna structure and the method of exciting the desired modes are described. The annular slot antenna is suitable for use as a flush-mounted D/F antenna. The radiation pattern is essentially a cardioid with a minimum 22 db below adjacent maxima, and can be rotated by continuously varying the phase between the TE_{11} and the TEM feed lines. A moderate frequency range is considered possible without severe deterioration of the pattern since the slot is nearly resonant at the design frequency. The effect of the cross-polarization component on the 3-dimensional pattern is considered, and theoretical and experimental patterns are included for comparison. See also AD-110 291, AD-133 733. (a-3, b-3, c-1, d-1, e-0, f-Description)

3770. STALDER, J. J., "A Study of Automatic Signal Selection for Airborne Direction Finders," New York University College of Engineering, New York, Final Report, Contract DA 36-039-sc-72806, ASTIA No. AD-154 927; 14 October 1957. ABSTRACT: A human factor's investigation was made to determine the psychophysical actions employed in taking aural-null type direction finding bearings in the presence of interference. A human operator's ability to obtain more accurate bearings than a conventional ADF, in the presence of interference, was found to be due - at least partly - to his ability to act as a narrow band pass filter and his ability to achieve time filtering on the basis of integration and correlation techniques. An engineering investigation led to development and preliminary evaluation of an automatic direction finder expected to exhibit the advantages of aural-null operation in the presence of interference. Analysis indicated that the use of coherent detection methods to derive a loop antenna control signal, from transmitted identifying modulation, would permit accurate automatic bearing determinations in the presence of interference. A preliminary system, based upon synchrodyne detection of identifying amplitude modulation, was developed. Comparison showed that this system was superior to the conventional ADF with regard to bearing accuracy in the presence of interference at and near carrier frequency. It is anticipated that an optimized coherent or quasi coherent ADF system, operating on identifiable modulation, will provide adequate bearing accuracy when atmospheric interference, causing appreciable bearing error with the conventional ADF occurs. See also AD-149 175. (a-1, b-3, c-1, d-1, e-0, f-Study)

3771. ANONYMOUS, "Preproduction Evaluation of AN/SRD-7 Field Change Kit No. 1 Manufactured by Stewart Warner Electronics,Chicago, Illinois," Material Laboratory, New York Naval Shipyard, Final Technical Report No. 24; October 1957. See also ASTIA No. AD-156 660. ABSTRACT The field change kit was evaluated to determine conformance with Spec SHIPS-F-2345 and applicable requirements for type I, class A field change kits in general Spec MIL-F-17655A (SHIPS). The AN/SRD-7 model is a shipboard equipment covering the 250-kc to 32-mc frequency range. It combines D/F and panoramic frequency scanning into a single equipment. The principal components are a power transformer, relay, a 4 pole double throw toggle switch, and an indicator lamp. Results of the evaluation show that the AN/SRD-7 field change kit no. 1 failed to meet 3 specification requirements of Spec MIL-F-17655A (SHIPS). (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

3772. TRAVERS, D. N., MOORE, J. D., ET AL., "Direction-Finder, Radio, Shipboard, Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. 64585, ASTIA No. AD-201 632L; 16 October 1957. ABSTRACT: The calibration of the AN/SRD-7 HF/DF on board the U.S.S. PETERSON by automatic methods is described in detail. The calibration curves are reproduced and sample photographs of the actual patterns observed during calibration are included. The successful results of the calibration are compared to certain marginal conditions under which it was performed and under which it is assumed previous manual calibrations have also been performed. The calibration by substitution equipment is described in its current breadboard form. Its performance in recent tests is described and the date of a planned demonstration is given. The status of the spaced loop antenna and the three loop antenna is reviewed, with recent progress described in detail. Difficulties are described which were encountered in eliminating some of the extraneous causes of pattern distortion. A successful new test setup to reduce direct pickup is described. The manner in which measured antenna patterns are harmonically analyzed to determine distortion causes is explained in detail with specific reference to data taken with the small spaced loop now under test. Conclusions drawn from these analyses are given. The development of a printed circuit RF coupling transformer with high symmetry factor is reported. Nonrotating models have been produced with symmetry factors above 100,000 at certain frequencies. It is now reasonably certain that a balanced transformer can be produced with a symmetry factor of 1000 or more to 32 mc. The need for high symmetry factor is reviewed. Tests underway at this time to determine existing symmetry factors in the AN/SRD-7 are incomplete but sufficiently advanced to indicate that, with regard to this characteristic, the AN/SRD-7 is poor. The work toward the development of a three-loop antenna mixing circuit is reviewed and recent progress with methods directly applicable to the AN/SRD-7 is covered. An AN/SRD-7 equipment has been modified to operate with two rotating HF coupling transformers, the second installed in place of the original low frequency winding in the same transformer assembly. This modified system has been demonstrated with a three-loop antenna in an inductive field produced in a screen room. (a-1, b-3, c-1, d-1, e-1000, f-See Abstract No. 3735)

3773. ANONYMOUS, "Handbook of Instructions for Direction Finder Set AN/ARD-10 (XY-1)," Farnsworth Electronics Company, Fort Wayne, Indiana, Volume I, Contract No. AF 33(600)25523, ASTIA No. AD-147 291; 29 October 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3774. BARTHEL, D., BATES, J. K., ET AL., "Airborne Electronic (Ferret) Reconnaissance System," Federal Telecommunication Laboratories, Nutley, New Jersey, Interim Report, Contract AF 33(600)-27521, ASTIA No. AD-148 308; November 1957. ABSTRACT: Not available. (a-4 b-3, c-1, d-1, e-0, f-0)

3775. BEAN, B. R., AND CAHOON, B. A., "The Use of Surface Weather Observations to Predict the Total Atmospheric Bending of Radio Waves at Small Elevation Angles," Proc. IRE, vol. 45, no. 11; November 1957. ABSTRACT: Recent investigations of the atmospheric bending of radio rays have been based upon either a smoothed long term average refractive index profile or refractive index profiles derived from "mandatory" standard pressure level data from radiosonde observations neither of which includes the effects of commonly observed marked departures of the actual refractive index profile from the smoothed profiles so obtained. It is the purpose of the present study to evaluate any possible effects of these departures by use of the radiosonde "significant" level data. Even with allowance for these departures from a smooth profile, it will be shown that the surface value of the refractivity alone may be used to predict the total bending with useful accuracy even for elevation angles of arrival or departure, θ_o, as small as 10 milliradians. The analysis was extended to $\theta_o = 0$ by substitution of profiles with strong ground based refractive layers for the ducting profile since it was found that the rays were trapped at $\theta_o < 8.8$ milliradians. (a-1, b-1, c-1, c-1, d-864, f-Theory)

3776. DOLUKHANOV, M. P., "Investigations in the USSR on Radio-Wave Propagation over the Earth's Surface," Radiotekhnika i Elektronika, vol. 2, no. 11, pp. 1344-1359; November 1957. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-Study. A translation is cited in Radio Engineering and Electronics, N.D.)

3777. GROSSKOPF, J., AND VOGT, K., "The Polarization Direction-Finder," Nachrtech. Z., vol. 10, pp. 572-579; November 1957. ABSTRACT: Report on experimental investigations made in 1944 on behalf of the German navy on SWDF system with a combined dipole and loop antenna. Three different arrangements are considered: (a) vertical loop with vertical dipole, (b) horizontal loop with horizontal dipole, and (c) vertical loop with horizontal dipole. The theory of operation of the system is detailed and diagrams of phase and amplitude difference as a function of azimuth angle are given for various types of polarization. A combination of arrangements (a) and (b) is the most generally useful. Interference due to the incidence of two waves is also considered. The polarization type of direction finder can provide results as accurate as those obtained by the Adcock system with the additional advantage of a much more compact antenna arrangement. (a-5, b-2, c-4, d-4, e-0, f-Study)

3778. JOHNSON, B. R., "A New Receiver for the Australian D.M.E. Beacon," Proc. IRE, Aust., vol. 18, pp. 423-430; November 1957. ABSTRACT: The receiver described operates at 206 mc, has a triggering sensitivity of 3μV and echo suppression by instantaneous AGC. Performance figures and the results of field trials are given. (a-3, b-1, c-1, d-11, e-0, f-Description)

3779. JOHNSON, S. F., "The Maintenance of Fractional Degree Phasing between Two Separate AC Voltages or Rotating Shafts," NRL Report 5043; November 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3780. KAZANTSEV, A. N., "Research in the USSR on Radiowave Propagation in the Ionosphere," Radiotekhnika i Elektronika, vol. 2, no. 11, pp. 1360-1374; November 1957. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-Study and survey. A translation exists in Radio Engineering and Electronics)

3781. MINGINS, C. R., "Electromagnetic Wave Fields near the Earth's Surface," Proc. IRE, vol. 25, no. 11, pp. 1419-1456; November 1957. ABSTRACT: It is shown that in the case of frequencies where the ground wave is of importance any indirect waves can be investigated by keeping within the "skywave furrow" of the directional pattern of a loop receptor. Observations indicate multiple downcoming waves in the daytime, with marked changes occurring toward sunset. Conditions during the day are as a rule steady and sometimes resume their steadiness after the sunset fluctuation period. During steady conditions observations were made of the field in the neighborhood of various systems involving boundaries between media of different conductivities, such as horizontal and vertical conductors near the earth's surface and the gorges which characterize the terrain in and about Ithaca. The results are interpreted on the basis of a steady field upon which is superimposed a perturbation field due to a conductor or anti-conductor of conductivity $\pm\Delta\sigma$. Several ways in which the wave plurality may be accounted for are discussed. (a-1, b-1, c-1, d-1, e-0, f-Theoretical and experimental investigation of downcoming waves)

3782. NORMAN, F. J., AND WARD, J. F., "Rhombic Aerials - Design Charts for High Frequencies," Electronic and Radio Engineer, vol. 34, no. 11, pp. 398-403; November 1957. ABSTRACT: The design of aperiodic rhombic antennas is examined and a method derived whereby a set of charts of open scale yields all the antenna parameters of practical significance for high-frequency operation. The angle of fire and the gain with respect to a dipole in free space are displayed for an adequate range of antenna side lengths and included angles. Corrections are given for the height above ground and a simple method to find the shape of the main lobe is suggested. (a-1, b-2, c-1, d-5, e-0, f-Description)

3783. MAENHOUT, A., "Azimuth Distribution of Sferics Received at Dourbes on Kilometer Waves," Ciel et Terre, Brussels, vol. 73, nos. 11-12, pp. 499-505; November-December 1957. ABSTRACT: Not available. (a-4, b-1, c-3, d-15, e-0, f-Study)

3784. ANONYMOUS, "Contributions on Aeronautical and Navigational Electronics, Inst. Radio Engrs.," Trans. IRE, vol. ANE-4, no. 3; September-December 1957. ABSTRACT: Miscellaneous papers on aeronautical navigation and navigational equipment by various authors. (a-4, b-1, c-1, d-1, e-0, f-Various papers)

3785. SIMAS, V. R., AND BARTHOLOMEW, C. A., "Project Vanguard Report No. 23, Receiver System," NRL Report 5055. See also Department of Commerce PB131390; December 1957. ABSTRACT: This report describes, with schematics, the five units comprising a single rf channel, i.e., a pair of front ends, a signal adder, a combined IF amplifier, a special local oscillator, and a calibration source. (a-3, b-3, c-1, d-1, e-0, f-Description. See Abstract Nos. 3726 and 3752)

3786. WILSTENHAGEN, J., "Loop Antennas for Long Waves," Rundfunktech Mitt., vol. 1, pp. 237-243; December 1957. ABSTRACT: The suitability of loop antennas for transmission in the long-wave band is discussed with reference to input impedance, efficiency and bandwidth. A method of calculating input impedance over a wide frequency range is given; results of model tests confirm its accuracy. An advantage of loop antennas is that their input impedance can be varied within wide limits by appropriate structural changes. (a-3, b-2, c-4, d-4, e-0, f-Description)

3787. KLUG, S. H., KOCH, R. F., ET AL., "Unattended Electronic Ferret Reconnaissance Set AN/DLD-2 (XA-1)," Airborne Instruments Laboratories, Incorporated, Mineola, New York, Interim Report, Contract No. AF 33(600)32145, ASTIA No. AD-161 450; 2 December 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3788. FINK, C., AND BUEHLER, G. V., ET AL., "Modification Kit MK-383( )/TRD for Direction Finder Group OA-1034(XE-1)," Litton Industries, College Park, Maryland, Quarterly Report No. 1, Contract DA 36-039-sc-74901, ASTIA No. AD-208 430; 12 December 1957. ABSTRACT: An array system for direction finding purposes, consisting of four dipoles located in the horizontal plane has been completed. The system covers a frequency band of 550-1100 mc (Band "C"). The proper phasing of the array elements is accomplished by means of four 3 db directional couplers for the switched lobe, with a 4:1 matching network (Tchebischeff taper) for the single lobe mode of operation. The crossover level in the switched lobe mode of operation falls between 3 and 6 db below the individual beam maxima. The measured pointing accuracy for switched as well as for single lobe operation is within plus or minus one degree. To meet the requirements the directional couplers used in the direction finding system are designed so as not to exceed plus or minus .75 db from 3 db coupling and the directivity is greater than 25 db over the prescribed band. For single lobe operation where the array elements are equally phased by means of a 4:1 power divider (power split) an SWR of 1.5:1 was achieved. See also AD-206 478. (a-1, b-3, c-1, d-1, e-0, f-Equipment modification)

3789. ANONYMOUS, "Direction Finder System AN/TLQ-8 (XW-1)," Ramo-Wooldridge Corporation, Los Angeles, California, Interim Report, Contract No. AF 30(602)1687, ASTIA No. AD-148 610; 20 December 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3790. ANONYMOUS, "Research on Antennas for Aircraft and Missiles," Antenna Laboratory, Ohio State University, Research Foundation, Columbus, Ohio, Summary Report, Contract AF 33(616)-3353, ASTIA No. AD-162 715; 31 December 1957. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

1958

3791. ANONYMOUS, "Bearings of HF Signals," J. Inst. Elec. Comm. Engr., Japan, vol. 41, p. 137; 1958. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-0)

3792. ANONYMOUS, "Selected Articles from Radio, No. 8," Air Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio, ASTIA No. AD-153 403; 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Translation)

3793. BAILEY, V. A., "Some Methods for Studying Wave-Propagation in a Uniform Magnetoionic Medium," J. atmos. terrest. Phys., vol. 12, nos. 2/3, pp. 118-125; 1958. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

3794. BENOIT, R. C., AND COUGHLIN, F., "New Trends in Directional Communications," IRE Nat. Conv. Record, vol. 6, Part 1, pp. 230-236; 1958. ABSTRACT: In order to provide sufficient, effective and reliable radio communications to fulfill present and future requirements, more effective use must be made of the available frequency spectrum. The employment of steerable directional communications concepts is an approach toward meeting this objective to a marked degree. This paper discusses directional communications techniques being investigated by the USAF at Rome Air Development Center for use in the LF, HF, VHF and UHF regions. In this ever expanding space age, electrical communications play an extremely vital role. No large scale military or civilian endeavor can be successful without sufficient, reliable and effective communications. Present day communications capabilities leave much to be desired and must be improved to keep pace with future requirements. In the field of radio communications, as in all other fields, our capabilities are necessarily limited by the available resources and the use we make of them. To delineate, the prime resources are, the available frequency spectrum, technological knowledge and the availability of equipment and personnel to operate and maintain these equipments. In order to effectively meet the challenge of the future, we must take stock of our resources and employ them in the most efficient manner possible. We can increase technical knowledge by vigorous scientific and training programs and the amount of equipment by accelerated production programs. Of all the available resources, frequency spectrum is one of the most critical and will become more critical as time passes. We know of no way today to actually expand the frequency spectrum and therefore, we must make more efficient use of what is available. In this respect, polyphase and other unique modulation methods, data compression techniques, more efficient utilization of radiated power and directional communications concepts offer possibilities. The employment of directional communi-

cations concepts permits us to make more efficient use of the frequency spectrum and radiated power by concentrating the signal in a narrow beam in the desired direction. In addition to this primary advantage, directional communications also provide some degree of privacy and great freedom from jamming and interference, which in turn engender improved reliability. Since the prime requirement of the communicator is to get the message "through," there is really no need to radiate the signal in all directions when the point of contact is a discrete one; for example, in point-to-point, ground-to-air and earth to satellite or planet communications, sometimes called "cosmications." Using these concepts, it is possible to rapidly transmit several sequential messages to different locations on a single frequency or simultaneous messages on different frequencies with a steerable multilobe antenna array. A directional communications terminal consists basically of a steerable transmitting and receiving antenna array, a radio receiver, control and instrumentation equipment and a radio transmitter. Portions of such a configuration may be used for radio location purposes. To gainfully exploit directional communications concepts to the fullest extent, it is necessary to concentrate the signal in the narrowest possible beam. However, from a practical viewpoint, the size of the array and economic considerations must be weighed in comparison to the operational requirements and performance achieved. (a-1, b-1, c-1, d-1, e-0, f-Summary and survey)

3795. BRIGGS, B. H., "A Study of Ionospheric Irregularities Which Cause Spread-F Echoes and Scintillations of Radio Stars," J. atmos. terrest. Phys., vol. 12, p. 34; 1958. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Study)

3796. CROMBIE, D. D., "Difference between the East-West and West-East Propagation of VLF Signals over Long Distances," J. atmos. terrest. Phys., vol. 12, nos. 2/3, pp. 110-117; 1958. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-0)

3797. ERUKHIMOVICH, YU. A., "The Influence of Asymmetry on the Working of a Radio Direction-Finder," Radiotekhnika, vol. 13, no. 10, pp. 64-75; 1958. ABSTRACT: The instrumental accuracy of the multi-mast type of direction-finder is determined largely by its asymmetries and these in turn can only be controlled by engineering tolerances. Phase asymmetry is shown to be more dangerous than amplitude unbalance, particularly with long-wave sets which cover a wide tuning range. With amplitude asymmetry the directional error is small but the minimum is badly blurred; with phase asymmetry the inverse is the case. It is shown possible to compensate for the systematic part of the instrument error by introducing an artificial, adjustable asymmetry. Before this can be realised in practice more experimental work is needed. (a-2, b-2, c-2, d-2, e-0, f-Analysis)

3798. HEISLER, L. H., "Anomalies in Ionosonde Records Due to Travelling Ionospheric Disturbances," Austr. J. Phys., vol. 11, p. 79, 1958. ABSTRACT: Anomalies which frequently appear on ionosonde records of the F region during the passage of travelling disturbances are classified into four main types; and the diurnal and seasonal distribution of their occurrence is discussed. It is suggested that the type of anomaly appearing on records depends on the ion density distribution at a height of about 200 km, which appears to be an upper bounding surface for the mode of travel of disturbances. A particular study has been made of winter disturbances. These are found to be so frequent that they affect all ionosonde records obtained during this season. They travel distances of at least 3000 km with fronts possibly broader than 1000 km. Attempted correlation with geomagnetic storminess was unsuccessful. Information is also presented on similar disturbances observed in North America. (a-1, b-1, c-1, d-11, e-0, f-Analysis)

3799. HOUGARDY, H. H., AND YARU, N., "Annular Slot Direction-Finding Antenna," IRE Nat. Conv. Record, vol. 6, Part 1, pp. 177-182; 1958. ABSTRACT: The radiation characteristics of a flush-mounted, cardioid-pattern, direction-finding aerial are discussed. By use of the general equations for the far field of an annular slot in an infinite and perfectly conducting ground plane, expressions are derived for the radiation field of an aerial consisting of a single annular slot fed with a cylindrical waveguide excited with two orthogonal TE_{11} modes and the TEM mode. The structure of the aerial and the method of exciting the desired modes are described. The effect of the cross-polarization component on the three-dimensional pattern is considered, and theoretical and experimental patterns are included for comparison. (a-2, b-1, c-1, d-1, e-0, f-Discussion and analysis)

3800. KALLMANN, H. K., "A New Model of the Atmosphere and Ionosphere," Ann. Geophys., vol. 14, no. 2, pp. 140-143; 1958. ABSTRACT: The variation of electron density with height in the atmosphere was determined theoretically, using a new model of the atmosphere as derived from rocket observations. The results compare favourably with direct rocket measurements of electron densities, but they give a somewhat different picture of the ionosphere from that deduced from simultaneous P'f recordings. (a-3, b-1, c-3, d-3, e-0, f-Description)

3801. KENNAUGH, E. M., AND COSGRIFF, R. L., "The Use of Impulse Response in Electromagnetic Scattering Problems," IRE Nat. Conv. Record, Part 1, pp. 72-77; 1958. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-0)

3802. KING, J. W., "The Fading of Radio Waves Reflected at Oblique Incidence," J. atmos. terrest. Phys., vol 12, no. 1, pp. 26-33; 1958. ABSTRACT: Previous experimental results on the reflection of radio waves from the ionosphere at near-vertical incidence have been extended to include the case of waves incident obliquely. It is shown that the radio diffraction pattern formed at the ground by a medium-frequency wave reflected at oblique incidence is very much larger than expected and is, on the average, roughly circular. It is concluded that the ionospheric irregularities responsible for the fading have much greater extent in the horizontal than in the vertical plane. It is found, in general, that the speed of fading of a wave of frequency f is proportional to f cos i, where i is the angle of incidence on the ionosphere, and that the probability distribution of amplitude tends to be log-normal rather than of the type discussed by Rice (Bell Syst. tech. J., vol. 27, p. 109: 1947). (a-3, b-1, c-1, d-5, e-0, f-Analysis)

3803. KITCHEN, F. A., "Direction-Finding Observations on the 20 Mc/s Transmissions from the Artificial Earth Satellites," Proc. Roy. Soc., Series A, vol. 248, p. 63; 1958. ABSTRACT: Some direction finding, and associated radio observations on the artificial earth satellites are described. It is shown that it should be possible to derive the elements of the local track from a single observational sequence on a nearby transit. Samples of several bearing transits are presented and discussed in relation to possible ionospheric propagation modes. Reference is made to the occurrence of irregularities in bearing, signal strength and Doppler records, which might yield data on the ionosphere if detailed orbit information becomes available. (a-1, b-1, c-1, d-5, e-0, f-Observation and analysis)

3804. KITCHEN, F. A., BILLAM, L. R., JOY, W. R. R., CLEAVER, R. F., COOPER-JONES, D. L., AND BEUKERS, J. M., "Some Direction-Finding Observations on the 20 Mc/s Signal," Proc. IEE, Part B, vol. 105, p. 89; 1958. ABSTRACT: The provision of transmissions on a frequency of about 20 Mc/s from the Russian artificial earth satellites presented a unique opportunity for an investigation of ionospheric wave-propagation phenomena, using direction-finding techniques. The equipment used was of the type described by Earp and Godfrey in 1947. In principle, its operation is equivalent to the rotation of a simple vertical dipole round the circumference of a circle of about 7 wavelengths' diameter at 20 Mc/s. This rotation imposes a phase modulation on the signal, the phase of which is used to derive the bearing information. One form of bearing display provided a permanent record of signal bearing, signal strength, time reference and calibration data. Elevation could be derived directly from the total phase excursion across the array. The use of data of this type, in conjunction with simultaneous recordings of the Doppler frequency shift, is sufficient to establish satellite track information for local orbits. Plan range and slant range at the instant of closest approach can be derived from the rate of change of azimuth and of Doppler frequency, respectively, using a value for satellite velocity obtained from the overall Doppler shift on an overhead transit. (a-1, b-1, c-1, d-5, e-0, f-Observation report)

3805. LITTLE, C. G., ET AL., "Radio Properties of the Auroral Ionosphere," University of Alaska, Geophysical Institute, Quarterly Progress Report Nos. 1-5, 7, 8; 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Observations concerning propagation)

3806. MALTBY, P., "The Determination of Position and Polarisation of Sources of Enhanced Solar Radiation on 200 Mc/s," University of Oslo, Norway, Scientific Report No. 10(20) on Contract AF 61(514)-1122, AFCRC-TN-58-471, ASTIA No. AD-160 747. See also Department of Commerce PB145646; 1958. ABSTRACT: An interferometer has been built at the Solar Observatory, Harestua, for observing the position of sources of enhanced solar radiation on 200 Mc/s. The interferometer, the method for analysing the observations, and some sources of error are described in Part I. Part II of the present paper

deals with the measurement of polarisation by means of three antennas, one of which is polarized orthogonally. Several sources of error are discussed. (a-1, b-3, c-1, d-21, e-0, f-Interferometer)

3807. MAC MILLAN, R. S., RUSCH, W. T. V., AND GOLDEN, R. M., "A New Antenna to Eliminate Ground Wave Interference in Ionospheric Sounding Experiments," J. atmos. terrest. Phys., vol. 13, nos. 1/2, pp. 183-186; 1958. ABSTRACT: Not available. (a-4, b-1, c-1, d-5, e-0, f-Description)

3808. MINNIS, C. M., "The Interpretation of Changes in the E and F1 Layer during Solar Eclipses," J. atmos. terrest. Phys., vol. 12, no. 4, pp. 272-282; 1958. ABSTRACT: Recent eclipse measurements have been explained in terms of the response of a Chapman layer to the obscuration of a solar disk on which localized sources of ionizing radiation are superposed on a uniformly bright background. This interpretation is supported by several features of the results obtained during a series of eclipses. An alternative interpretation postulates a complex layer containing two different species of ion but assumes only a uniformly bright solar disk. This hypothesis has been examined but calculations based on it result in expected changes in the layer, during an eclipse, which are not in accord with certain characteristics of the experimental data. A suggestion has been made that the layer tilts which occur during an eclipse may give rise to errors in the interpretation of the data. Experimental results are quoted which suggest that such errors are probably not important. (a-3, b-1, c-1, d-5, e-0, f-Theory and measurement)

3809. NADENENKO, B. S., AND LYALIKOV, V. V., "Analysis of Directional Properties of V-Antenna," Telecommunications, no. 10, pp. 1046-1053; 1958. ABSTRACT: Method for calculating polar diagrams of V-antenna with reflector of finite dimensions; tables of supplementary functions to facilitate use of formulas obtained; directional diagrams calculated from formulas are compared with experimental values. (a-3, b-2, c-1, d-2, e-0, f-Description)

3810. SAYBEL, A. G., AND NIKITIN, YE P., "Properties of Pulse Radio Range Finders with One Integrator," Radiotekhnika, no. 3, pp. 348-355; 1958. ABSTRACT: Pulse radio range finders with automatic range tracking of the target are, according to the author, widely used in radar and radio navigation systems. Such radio range finders are essentially pulse systems with automatic regulation. (a-5, b-2, c-2, d-2, e-952 (Abstract only), f-Descriptive analysis)

3811. STEINER, F., AND STITTGEN, H., "The Reduction of Wave Interference Bearing Errors by the Use of Large-Base Systems," NTZ-Nachr.-Tech. Z., vol. 11(8), pp. 417-423, 1958. ABSTRACT: See Abstract No. 3620. (a-4, b-1, c-4, d-4, e-Translation, f-Theory)

3812. TITHERIDGE, J. E., "Variations in the Direction of Arrival of High-Frequency Radio Waves," J. atmos terrest Phys., vol. 13, pp. 17-25; 1958. ABSTRACT: A general relation is derived for determining the effect of a non-horizontally uniform ionosphere on the propagation of short radio waves. The deviations for linear and parabolic layers are evaluated and the results generalized to include an ionosphere with several layers. Some experimental results showing large diurnal changes in apparent bearing are discussed and shown to be consistent with the foregoing theory. Measurements of the apparent heights of reflection of fixed-frequency radio-waves transmitted vertically upwards from different points on the earth's surface frequently indicate an apparent tilt of several degrees in the effective reflecting surface. This may be due to an overall tilt of the ionospheric layer, and the effect on oblique-incidence transmission is then simply obtained by considering the radio-waves to be reflected at a surface with this tilt. However, much of the observed variation in virtual height is often due to variations in the rate of increase of ionization with height above the base of the reflecting layer. The calculations in this case are less straightforward, and it will be shown that the deviations of a reflected wave are less than one-third as large as those obtained on the simple assumption of a uniformly tilted layer. RAWER (1951) showed that the horizontal gradients of electron density known to exist could cause appreciable distortion of ray paths. He evaluated the deviation to be expected for one particular form of ionosphere for which the differential equation of the ray-path was integrable. WALDO-LEWIS (1953) considered two more general cases of a parabolic layer varying in the direction of propagation. By approximating to the ray-path integral he obtained expressions giving the change in range and elevation angle of the reflected ray with an accuracy of 5-25 per cent. ARGENCE (1955) obtained expressions for the deviation at grazing incidence by approximate integration in some further cases. The present work is an attempt to provide a general relation which may be readily applied to any particular case including that of penetration of a layer, the main cause of the experimentally observed deviations described later. (a-1, b-1, c-1, d-5, e-436, f-Theory)

3813. TSVETNOV, V. V., "Phase Correlated Properties of Signals and Gaussian Noise in Two-Channel Phase Systems," Radio Engineering, vol. 13, no. 5, pp. 69-84; 1958. ABSTRACT: Derivation of analytical relationships for correlation functions of phase differences for case of pure noise and case of strong signals; correlated properties of phase differences are compared with correlated properties of gaussian noise envelope. (a-3, b-2, c-1, d-2, e-0, f-Analysis)

3814. TUCKER, D. G., "The Signal/Noise Performance of Electro-acoustic Strip Arrays," Acustica, vol. 8, pp. 53-62; 1958. ABSTRACT: The directivity curves and signal/noise performance of 14 different arrangements of a strip array are discussed and tabulated. (a-3, b-2, c-4, d-4, e-0, f-Evaluation)

3815. WHALE, H. A., AND DELVES, L. M., "Some Relations between the Bearing and Amplitude of a Fading Radio Wave," J. atmos. terrest. Phys., vol. 13, pp. 72-85; 1958. ABSTRACT: A correlation ratio connecting the changes in amplitude with the changes of bearing of a fading radio wave made up of a number of randomly phased components is derived. The modifications necessary when specular components are also present are indicated. Experimental measurements of the correlation ratio for waves reflected from the ionosphere are compared with the theory. An initially uniform, plane radio wave which has encountered a changing non-uniform medium exhibits, in consequence, variations in amplitude (fading) and in apparent wave normal direction. In the case of short radio waves reflected from the ionosphere, some of the variations arise from large scale changes in ionospheric conditions but most of the rapid variations are effects arising from the interference of the various scattered waves produced by the non-uniform (or "rough") ionosphere. The analysis and experimental results given in this paper represent an approach to an understanding of the relations existing between the variations of amplitude and the associated variations in bearing of a short-wave radio signal. Since the design of aerials for the reception of short-waves is aided by a knowledge of the variation of average signal level with direction these results may be of some importance, especially when the signal involved contains a large amount of scattered radiation. The present analysis starts from equations arising in the statistics of random noise as given by RICE (1945). From these, several probability distributions relating the signal amplitude to the wave-normal direction are here derived and it is found that most of these distributions are symmetrical about some mean wave normal direction. Some of our experimental distributions, however, are asymmetrical and this is attributed to the presence of two groups of waves with different mean directions, each containing an appreciable specular component. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

3816. WOLFE, J. L., "Satellite Tracking by H.F. Direction Finder," J. atmos. terrest. Phys., vol. 13, pp. 155-164; 1958. ABSTRACT: A method of satellite tracking using an HF direction finder is outlined and commented on. The results of Tracking Sputniks I and II are given, along with an approximation of the size of error to be expected. Radio direction finders have been used successfully to track surface objects having low velocities. The height and speed of the first earth satellite, launched on 4 October 1957, created new problems and exposed limitations in HF D/F tracking when the azimuth only can be measured. This report shows the method used in tracking Sputnik I by HF D/F and gives the results that were obtained. The equipment consisted of a twin-channel CR D/F with an Adcock antenna (WATSON-WATT and KEEN, 1922). All observations were made on the 20.005 Mc/s signal. The data was collected in two periods. On 7 and 8 October bearings were taken on the satellite over ground ranges up to 6500 miles. On 15 October tracking was again resumed, but the signals were much weaker than before. For close crossings, bearing changes up to 5°/sec were measured. Since it was impossible for an operator to get accurate bearing information quickly enough, the azimuth was recorded on paper at the rate of five readings/sec. (a-1, b-1, c-1, d-5, e-443, f-Description and comment)

3817. JOHNSON, B. R., "New Receiver for Australian D.M.E. Beacon," AWA Tech. Rev., vol. 10, no. 3, pp. 157-173; 1958. ABSTRACT: Beacon receiver designed to overcome problems of coverage and echo interference in Australian DME system; arrangement of rf stages which provide beacon triggering sensitivity of 3 μv and design criteria for instantaneous automatic gain control used for echo suppression; results of field trials of prototype equipment. (a-3, b-2, c-1, d-11, e-0, f-Description)

3818. BAIN, W. C., "The Angular Distribution of Energy Received by Ionospheric Forward Scattering at VHF," Proc. IEE, Part B, Suppl. 8, pp. 53-55, 73-78; January 1958. ABSTRACT: A study has been made of the angular distribution in the horizontal plane of the energy reaching Slough from a vhf transmitter at Gibraltar by scattering in the ionosphere. The mean bearing of the energy distribution is found to vary with time of day, and is, on the average, zero in the middle of the day and 7° west by night with reference to the great-circle path. The spread bearing of the incident energy at any time has a standard deviation with a mean value of about 6°. (a-3, b-1, c-1, d-5, e-0, f-Study)

3819. HATCH, J. F., AND BYATT, D. W. G., "Improvements in H.F. Direction Finding by Automatic Time Averaging," Marconi Rev., vol. 21, pp. 16-29, First Quarter; 1958. ABSTRACT NO. 1: Equipment is described for use with CW or ICW signals which gives automatically the mean bearing averaged over a range of time intervals. The improvement is assessed by comparison with simultaneous bearings observed on twin-channel CRDF equipment. ABSTRACT NO. 2: To enable bearings to be obtained when multipath propagation is causing wide deviations, a large number of readings may be taken over a given time interval and the average bearing taken as the true one. In the equipment described, a servo-controlled null-following goniometer is used. Its drive shaft carries a small mirror which reflects light from a lamp downwards towards a motor driven platform carrying a photocell and an impulse magnet. Both of these generate a pulse for each revolution of the platform, the interval between them depending on the angular position of the mirror on the goniometer drive shaft. The motor that drives the platform also drives a phonic wheel, which generates a pulse for every 1° of rotation of the platform. These pulses are gated, by a rectangular wave derived from the pulses produced by the magnet and p.e. cell, and passed to a bank of dekatron counters. These display the total number of degrees. The bearing samples are counted on a second bank of counters, triggered by the gating waveform. Both counts are reset to zero after 2.56 sec. Trial runs showed a worthwhile decrease in variance. ABSTRACT NO. 3: The instrumental accuracy of H.F. Direction Finders can be made of a high order, but limits are imposed by the accuracy of arrival of the wave. It has been found that considerable improvements can be made by averaging either in time or space. Space averaging involves the design of wide aperture aerial systems and introduces many complications and expensive equipment. Time averaging can be done by several fairly simple means with worthwhile results. In the following article, the design of equipment for use both with CW and with interrupted signals is described. Simultaneous measurements with a Cathode Ray Direction Finder at the Radio Research Station at Slough were made and the results compared. (a_1-3, a_2-5, a_3-1, b-2, c-1, d-5, e-0, f-Description)

3820. HEDLUND, D. A., AND EDWARDS, L. C., "Polarization Fading Over an Oblique Incidence Path," IRE Trans., vol. AP-6, no. 1, pp. 21-25; January 1958. ABSTRACT: Discusses the results of an investigation of polarization fading conducted over a one-hop F2 layer path from eastern Massachusetts approximately 1000 miles westward. Continuous recordings of pulse transmissions were made to study the instantaneous variations in amplitude of the vertically and horizontally polarized components of the received signal. Results are presented which show a strong dependence between the amplitudes of the two components. Deep fades on one component were found to be accompanied by maxima of the other. A possible interpretation is presented which involves interference between the magneto-ionic components and leads to some interesting conclusions regarding their characteristics. Results are also included to illustrate the variations in these signal levels as the muf is approached. (a-3, b-1, c-1, d-1, e-0, f-Analytical study)

3821. LAWRENCE, R. S., "An Investigation of the Perturbations Imposed upon Radio Waves Penetrating the Ionosphere," Proc. IRE, vol. 46, no. 1, pp. 315-320; January 1958. ABSTRACT: A new method has been devised to measure continuously the phase deviations introduced by the ionosphere into the signals from discrete sources. Sample recordings of measurements at frequencies of 53, 108, and 470 mc are given. An experiment combining this phase measuring technique and standard ionospheric soundings at the point of penetration of the line of sight is in progress and is expected to shed light upon the height of origin of ionospheric scintillations. (a-1, b-1, c-1, d-1, e-0, f-Study and analysis)

3822. MEADOWS, R. W., AND MOORAT, A. J. G., "The Effect of the Earth's Magnetic Field on Absorption for a Single-Hop Ionospheric Path," Proc. Instn. Elect. Engrs., Paper 2429R, publ. vol. 105B, pp. 33-37; January 1958. ABSTRACT: Magneto-ionic calculations show that deviative absorption is not necessarily negligible at vertical incidence for waves reflected from the E-region at frequencies considerably below the penetration value. Consequently, the value of absorption calculated by the conventional "non-deviative" formula for a short-wave oblique path from vertical-incidence absorption measurements tends to be too high. Deviative absorption on paths sufficiently oblique is, however, negligible. The calculations also show the effect of the earth's magnetic field on Martyn's absorption theorem to be similar to the effect of losses due to partial reflections: namely to make the absorption in decibels calculated from an oblique path from vertical-incidence measurements too low by a multiplying factor approaching the cosine of the angle of incidence. It is suggested that the absorption to be expected on a radio path might best be calculated by applying the conventional non-deviative formula to measurements made at oblique rather than at vertical incidence. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

3823. MOORE, J. D., ET AL., "Sense Fidelity Tests on a Model AN/SRD-7 Shipboard Radio Direction Finder Mounted on a Seven-Foot Mast," Task Summary Report Number II, Contract NObsr-64585, Southwest Research Institute; 8 January 1958. ABSTRACT: This report contains information describing the sense fidelity of the Model AN/SRD-7 shipboard direction finder which can be expected when the antenna is mounted on a seven-foot mast. The conditions of the field site where the tests were performed are described. The test procedure is discussed in detail. The limitations of the procedure and results are described. The results obtained throughout the frequency range are given along with photographs of typical sense patterns. It is concluded that the AN/SRD-7 will provide correct sense information without stubbing when its antenna is mounted on a seven-foot mast. (a-1, b-3, c-1, d-1, e-1000, f-Description of test)

3824. BUEHLER, G. V., AND WALDO, J. E., "Modification Kit MK-383( )/TRD for Direction Finder Group OA-1034(XE-1)/TRD," Litton Industries, College Park, Maryland, Quarterly Report No. 2, Contract No. DA 36-039-sc-74901, ASTIA No. AD-203 960; 15 January 1958. ABSTRACT: An array system for direction finding purposes consisting of two dipoles located in the horizontal plane has been completed. The investigation of the two-dipole method was performed because of requirements to decrease the wind load as a result of a system stress analysis. The Crossover level, using the two-dipole method in switched lobe mode of operations, falls between 1 and 2 db below the individual beam maxima for the closest possible spacing of the two dipoles. The pointing accuracy, within the limits of the band (550-1100 mc), can be maintained with ± 1 degree in single lobe as well as in switched lobe mode of operation. The sensitivity (steepness of slope at the crossover point) of the two-dipole method is not considered to be sufficient for this system, therefore, the four-dipole method with an individual reflector for each dipole was used. The four-dipole system (with individual reflectors) shows the same electrical performance as the system outlined in the first quarterly report. A chart showing nominal allowable wind velocities for different array combinations is included. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

3825. TRAVERS, D. N., MOORE, J. D., ET AL., "Direction-Finder, Radio, Shipboard, Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. 64585, ASTIA No. AD-201 633L; 26 January 1958. ABSTRACT: Further progress towards the development of a small spinning spaced loop version of the AN/SRD-7 equipment is described. It can now be stated that the significant remaining work necessary to complete the modified 2 to 32 mc AN/SRD-7 system for use with the three loop array includes: (1) Specification of a minimum acceptable spaced loop volume between 5000 and 500 cu in. (2) Determination of the insertion effect of the sense loop on the spaced loop pattern and specification of remedial measures, if necessary. (3) Completion of the determination of antenna pattern distortion caused by the AN/SRD-7 system, particularly from symmetry factor and direct pickup, and specification of remedial measures. A three loop mixing circuit suitable for use from 2.0 to 32.0 mc in the modified AN/SRD-7 system is now available in breadboard form. The circuit is sufficiently general so that it can serve for operational use in the field as well as servicing use in an enclosed screen room. The performance of this circuit is presented in considerable detail. Calculations have been completed to determine the exact field of the three loop array. It is shown that the near field components of the spaced loop and the simple loop are inphase whereas the far field components are in quadrature. The implications of this condition are explained in detail. A rotary printed circuit transformer for use from 2 to 32 mc has been constructed with a minimum symmetry factor of 2500. It is concluded that this transformer is adequate for the intended purpose. A detailed investigation of symmetry factor and direct pickup characteristics of the existing AN/SRD-7 system shows that minimum acceptable performance standards are not met with respect to these two items on the basis of published information in the literature.

Reciprocal error in the existing AN/SRD-7 may be the result of these imperfections. Both the symmetry factor and the direct pickup characteristics of the system must be improved before successful operation with the spaced loop or a three loop antenna can be achieved. A detailed description is given of a system now completed whereby a reradiated field can be artificially reproduced inside a laboratory screen room for the purpose of determining the reradiation error of a particular configuration of loop antennas. The performance of the system at 2.0 mc is compared to theoretical calculations published by the British, and it is shown that the differences are not significant. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract Nos. 3735 and 3772)

3826. DOMINICI, P., "Backscatter Sounding Data on 18.6 Mc/s Obtained at Torrechiaruccia (S. Marinella, Roma) from August 23, 1947 to January 31, 1958," Centro Radioelettrico Sperimentale, G. Marconi, Rome, Italy. ABSTRACT: Not available. (a-4, b-3, c-9, d-9, e-0, f-Propagation study)

3827. HINES, J. N., "A Discussion of the Beam-Direction Indicator Problem," Antenna Laboratory, Ohio State University Research Foundation, Columbus, Ohio, Report No. 667-20, Contract AF 33(616)-3353, ASTIA No. AD-200 969; 31 January 1958. ABSTRACT: The characteristics of the antenna-receiver system determine the pointing accuracy of a radar and set the requirements of a beam-direction indicator for scanning traveling-wave antennas. A measure of the agent that produces the scanning cannot be relied upon entirely to indicate the beam direction accurately if changes in environmental conditions change the parameters of either the antenna or the scanning agent, and therefore, a supplementary indicator may be required. The most popular of these measures the phase difference between two points along the antenna using conventional techniques. The accuracy required of this indicator corresponding to most pointing-accuracy requirements is quite reasonable, but its response is too slow when used with pulsed radars unless pulse-stretching techniques are employed. However, if a combination of the two indicators is used, then the combined system will compensate for changes that might result from changes in environment. (a-1, b-3, c-1, d-1, e-0, f-Discussion and analysis)

3828. ANDERSON, R. E., "Bearing Memory Improves Direction Finder," Electronics, vol. 31, pp. 44-48; 31 January 1958. ABSTRACT NO. 1: A high-frequency direction-finding equipment employing Doppler principles is described. The received wave is frequency-modulated by scanning round a fixed circular antenna array at 42 cps. Gaps between the pulses of a coded transmission are filled in by the use of a recording drum rotating at the scanning frequency. ABSTRACT NO. 2: The action of a rapidly rotating Doppler aerial is simulated by a 150 ft diam. array of 31 aerials each scanned 43 times per sec. by a rotating capacitively-coupled sectorial scanner. The target bearing is obtained by scanning the phase relations of the signals arriving at the aerials, which produces an fm modulation whose envelope phase depends only on the target signal bearing. A single pick-up head is used to record, reproduce, and erase pulse coded signals upon a memory drum, avoiding gaps in signals and drum speed variations. Signals are recorded to saturation, thus erasing existing signals on the drum, during signal reception, and the signal last recorded at the instant of signal cessation is reproduced until resumption of signal. Bearings are thus retained to ±3 degrees between signal pulses and after target transmitter ceases. The system is insensitive to aerial array misadjustments. (a_1-3, a_2-5, b-2, c-1, d-1, e-0, f-Description)

3829. BARTHEL, D., BATES, J. K., ET AL., "Airborne Electronic (Ferret) Reconnaissance System," Federal Telecommunication Laboratories, Nutley, New Jersey, Interim Report No. 13, Contract AF 33(600)27521, ASTIA No. AD-156 205; February 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3830. BEDNASH, C. S., AND CLIFFORD, V. F., "Direction Finder Group, UHF," Federal Telecommunication Laboratories, Nutley, New Jersey, Quarterly Report No. 1, Contract No. DA 36-039-sc-74839, ASTIA No. AD-161 593; February 1958. ABSTRACT: Development was initiated on a transportable D/F covering the range of 225 to 4000 mc. Mechanical and electrical problems associated with the program were reviewed. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3831. BEDNASH, C. S., AND CLIFFORD, V. F., "Direction Finder Group, UHF," Federal Telecommunication Laboratories, Nutley, New Jersey, Quarterly Report No. 2, Contract No. DA 36-039-sc-74839, ASTIA No. AD-161 592; February 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See preceding abstract)

3832. SAYBEL, A. G., "Characteristic of Accuracy in Radar Position Finding," Radiotekhnika, no. 2, pp. 214-221; 1958. ABSTRACT: It is considered expedient to characterize the accuracy of position finding either by an ellipse or ellipsoide of errors of the prescribed probability or by a linear error of location of the prescribed probability. The paper presents relationships between the dimensions of the ellipse or the ellipsoid of errors of the given probability and the magnitudes of RMS errors of the measured coordinates. Functions of distribution of location errors with circular, elliptica, and spherical scattering are examined. It is assumed that random errors of measured coordinates have a normal (Gaussian) distribution. (a-1, b-2, c-2, d-2, e-952, f-Analysis)

3833. THOMAS, J. A., "Remote Operation Kit, QRC-36(T)," Rome Air Development Center, Griffiss Air Force Base, New York, Report No. RADC TN-58-40, ASTIA No. AD-148 585; February 1958. ABSTRACT: A technique is described for the construction of a remote-controlled direction-finding apparatus which permits operation of a radio receiver from a distance up to 3000 feet. The theory of operation is explained, and a detailed description is presented of several components of the equipment, including multiplex frequency decoder, servo-controlled receiver, sweep goniometer, master goniometer control, and receiver control. (a-1, b-3, c-1, d-1, e-0, f-Description)

3834. SCHAEFER, C. W., "Low Frequency ADF Radio Receiver, Bendix Radio Type DFA 70, Operational Test and Evaluation of," Naval Air Test Center, Patuxent River, Maryland, Final Report, Contract No. TED No. PTR EL-6001, Serial No. ET 312-26, ASTIA No. AD-153 328; 5 February 1958. ABSTRACT: The Bendix Type DFA-70 Automatic Direction Finder System is an airborne navigation equipment covering the low/medium frequency radio range and standard broadcast frequencies between 90 and 1750 kilocycles. Flight and laboratory tests of the Type DFA-70 ADF were conducted in order to determine its performance and suitability for use in high performance military aircraft. The results of the tests showed that the DFA-70 ADF was comparable in performance to currently available ADF systems. The DFA-70 ADF system shows little difference from other existing ADF systems in regard to physical size, weight, power consumption, bearing accuracy and maximum range performance under both normal and precipitation static conditions. (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

3835. KHASTGIR, S. R., "Abnormal Polarization of the Atmospheric Pulses Reflected Successively from the Ionosphere," Nature, vol. 181, no. 4606, pp. 404-405; 8 February 1958. ABSTRACT: During the recording of atmospherics in India, many cases of elliptic patterns have been observed on the crt direction-finder. These showed continuously changing eccentricity and tilt-angle, and almost certainly represent abnormal polarization of the atmospheric pulses reflected successively from the ionosphere. (a-3, b-2, c-1, d-5, e-0, f-Experimental analysis)

3836. ANONYMOUS, "Direction Finder System AN/TLQ-8 (XW 1)," Ramo-Wooldridge Corporation, Los Angeles, California, Interim Report, Contract No. AF 30(602)1656, ASTIA No. AD-148 680; 20 February 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3837. BROWN, L. B., AND SCHARP, G. A., "Tschebyscheff Antenna Distribution, Beamwidth, and Gain Tables," NAVORD Report No. 4629 (NOLC Report 383), Naval Ordnance Laboratory, Corona, California; 28 February 1958. ABSTRACT: Tschebyscheff antenna distributions, beamwidths, and gain data for linear broadside arrays of isotropic radiators are given for 3 through 40 elements, and for side-lobe levels from 0 through 40 decibels for each array. The computations, which were made on an electronic digital computer, are arranged in tables for ready reference. (a-1, b-3, c-1, d-1, e-0, f-Tables)

3838. BADY, I., "Measurement of Losses of Magnetic Materials at High Inductions at Frequencies up to 100 Megacycles," J. Applied Physics, vol. 29, no. 3, pp. 393-394; March 1958. ABSTRACT: Methods for measuring ferrites at high inductions are given. For frequencies below 50 megacycles, a conventional series resonant circuit issued, and coupled to a high power signal source through a variable capacitive attenuator. The test sample is in the form of a toroid with an appropriate winding. The Q of the test sample is determined with the aid of an air coil whose Q is known. Harmonics sources of errors, and pulse modulation are discussed. For frequencies of 50 megacycles and above, a short circuited coaxial slot-

ted line is used. To get high currents into the slotted line, it is inductively coupled to a high power signal source and tuned to resonance by means of a capacitor. A method for determining the current in the line is given. (a-5, b-1, c-1, d-1, e-0, f-Description)

3839. BARBER, N. F., "Optimum Arrays for Direction Finding," New Zealand J. Sci., vol. 1, no. 1, pp. 35-51; March 1958. ABSTRACT: Incoherent waves that come from a distributed source may be thought of as being the sum of innumerable coherent wave trains whose directions and wavelengths differ. The paper concerns the design of an array of receivers that is intended to explore the distribution of wave power with wave direction. It is shown possible to realise in practice arrays which determine the distribution of power with the minimum mean square error that is theoretically possible. Various examples are discussed, including the mills cross. (a-2, b-1, c-1, d-10, e-463, f-Theory and review)

3840. BENNETT, P. E., DANIELS, R. E., ET AL., "Extremely High Altitude Ferret Reconnaissance Study," Haller, Raymond, and Brown, Incorporated, State College, Pennsylvania, Quarterly Report No. 1, Contract AF 33(616)5471, ASTIA No. AD-156 983, March 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3841. BLACKBAND, W. T., "List of Published References on Radio Aerials," Royal Aircraft Establishment, Great Britain, ASTIA No. AD-215 799 L; March 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-Reference bibliography)

3842. EARP, C. W., AND COOPER-JONES, D. L., "The Practical Evolution of the Commutated-Aerial Direction-Finding System," Proc. Instn. Elect. Engrs., Paper 2569R, vol. 105, Part B, Supplement No. 9, pp. 317-325, 326-332; March 1958. ABSTRACT: This paper sets out to show how the more fundamental problems encountered in the development of the commutated-aerial direction-finding system have been solved during a long-term development plan. Reasons are given for the choice of a circular array of aerials, which are commutated sequentially to the receiving equipment. It is shown how such an arrangement permits great economy in the number of aerials required for a given system performance, maximum adjacent aerial spacing being much larger than might at first appear permissible, and the method for computation of the signal bearing is described in some detail. Significant features of the development are described, particularly where problems are peculiar to the system, such as realization of adequate selectivity despite aerial commutation and the avoidance of the effect of aerial interaction. Final practical circuits are described for signal processing and demodulation, and for the display of bearing, and it is shown that the solutions adopted should permit realization of the performance predicted by theoretical study some 10 years ago. Although practical experience in the field is not yet large, adequate practical measurements have been made to substantiate most of the theoretical predictions with regard to performance. (a-1, b-1, c-1, d-5, e-469 and 636, f-Theory and experiment)

3843. GARFIELD, W. L., "Tacan: A Navigation System for Aircraft," JIEE, vol. 105, Part B, Supplement No. 9, pp. 298-306; March 1958. ABSTRACT: TACAN is the latest form of rho-theta navigation system for aircraft and embodies certain novel features. The system characteristics are briefly described and a short history of its beginning and development are given. Basic principles of operation are followed by a description of the apparatus required, and the advantages of the system for bad site operation is discussed. Additional facilities are described, such as data link and approach aid integrated with TACAN, and a summary of the system advantages is given. TACAN, a polar co-ordinate system of navigation, combines into one system and one set of equipment two hitherto separate but major navigational requirements. These two requirements are the measurement of bearing from some fixed point and the measurement of distance from a known fix. In the past these two quantities have been provided by totally different types of equipment developed by different types of user. During and after the Second World War, military aviation concentrated on pulse techniques, and by the use of radar and secondary radar the great operational benefits to be obtained from a continuous presentation of distance from a known ground station have been very forcibly demonstrated. The provision of a homing facility on most of these responder-beacon systems indicates that some form of bearing measurement has always been required, but never completely provided On the other hand, civil aviation has favoured the use of cw techniques with an emphasis on bearing measurement. Thus automatic direction-finding from an aircraft is an established art, and the V.O.R. system is rapidly coming into world-wide usage. This latter system is of great importance to TACAN, since V.O.R. has produced and proved methods of automatic bearing presentation and selection which are likely to persist regardless of the navigational system employed. (a-1, b-1, c-1, d-5, e-0, f-Description)

3844. GREGORY, J. B., "Medium Frequency Observations of the Lower Ionosphere during Sudden Disturbances," J. Geophys. Research, vol. 63, no. 1, pp. 273-275, March 1958. ABSTRACT: Suggestions have been made by Friedman and Chubb that sudden ionospheric disturbances may be due to an increase in the soft X-ray flux penetrating to the lower ionosphere, rather than to an increase in the intensity of Lyman-α radiation. These workers and their colleagues have shown that during a small solar flare, which did not produce a detectable radio fade-out, an increase in soft X-radiation occurred above 75-km height. In estimating the intensities at various wavelengths necessary to produce extra ionisation, Friedman and Chubb have used values of height derived from low-frequency radio observations, mostly of sudden phase anomalies. It is the purpose of this note to present evidence obtained from medium-frequency observations of the conditon of the lower ionosphere during disturbances. The data given have been gathered during studies of the lower ionosphere by means of a fixed-frequency (1.75 Mc/s) pulse-sounding apparatus of high sensitivity. Typical records and preliminary results of these studies have been presented by the writer. Records taken during undisturbed conditions show partial reflections, from 50 km upwards, which vary in strength, height, duration, and fading rate; and a disturbance is revealed through changes in these reflections. (a-1, b-1, c-1, d-1, e-0, f-Observation and study)

3845. GRIMES, D. M., "Miniaturized Resonant Antenna Using Ferrites," J. Applied Physics, vol. 29, no. 3, pp. 401-402; March 1958. ABSTRACT: The radiation resistance and reactance of point source dipoles are profoundly affected by the surrounding medium. A radiator of length l in an infinite ferrite medium is electrically μl meters long if $\mu = \epsilon$ (relative permeability and permittivity). For very small ferrite spheres, the radiation resistance is determined by the relative permittivity, the effective reactance length by both the permittivity and the permeability. Thus it is possible to exchange length for resistance. Further work on linear radiators surrounded by ferrite in the form of a prolate figure of revolution is indicated. (a-5, b-1, c-1, d-1, e-0, f-Analysis)

3846. HOPKINS, H. G., AND PRESSEY, B. G., "Current Direction-Finding Practice," Proc. Inst. Elec. Engrs., Paper 2579R, Part B, Suppl. 9, pp. 307-316, 326-332; March 1958. ABSTRACT: Direction-finding practice in Britain is reviewed over the frequency band 10 kc/s-400 Mc/s; the survey is restricted to land-based systems. Current applications are outlined, the factors affecting accuracy are discussed with particular reference to those concerned with propagation, and equipment is described. The applications are numerous, ranging from location of thunderstorms at the lowest frequencies to widespread aeronautical uses at the highest frequencies. Over the lower parts of the frequency range the effects of the ionosphere on accuracy have to be borne in mind in many of the applications. In the vhf and uhf bands these limitations are absent for short-range working and the accuracy is determined largely by site and instrumental properties. The majority of direction-finders in current use have fixed aerial systems, the most common being the Adcock type. At the lower frequencies, however, loops are used, and wide-aperture systems having circular arrays of aerial elements are finding application at the higher frequencies. Regarding the display of bearing information, although some use is still made of the aural-null method, automatic presentation of the bearing either on a meter or on a cathode-ray tube is generally employed. For aeronautical purposes in the vhf and uhf bands, where development has been particularly marked, remote control of the equipment and remote display of the bearings (on a number of frequencies simultaneously, if required) are of increasing importance. A description of automatic position-fixing systems for which these remotely operated instruments are especially adapted is included. (a-1, b-1, c-1, d-5, e-457 and 636, f-Review)

3847. POLYDOROFF, W. J., "Magnetic Field Antenna," Electronic Industries, vol. 17, no. 3, p. 66; March 1958. ABSTRACT: Discusses the present day "frame aerial" and its effective height, Maxwell's Equation of velocity of propagation, the insertion of magnetic core material into a coil and its effect on u, and then introduces the approach of considering the loop antenna as a strictly electromagnetic device. Core effects are discussed and some applications, and ferrite rod cores are considered as a means of bending and redirecting a wave front. (a-5, b-2, c-1, d-1, e-0, f-Survey and discussion)

3848. SLETTEN, C. J., ET AL., "New Single Antenna Interferometer System Using Proximity-Coupled Radiators," Air Force Cambridge Research Center, Bedford, Massachusetts, ASTIA No. AD-152 364.

See Department of Commerce PB135216; March 1958 ABSTRACT: A new dual terminal antenna composed of 22 proximity-coupled radiating elements is described. This paper discusses the analytic behavior of dual-terminal arrays and presents experimental results with the sun, moon, and Explorer I as sources. A new stable integrating receiver is presented in detail. This "single antenna interferometer" and radio astronomy receiver gives a single angle bearing to high accuracy on very weak signals without ambiguity. Excellent meridian crossing data on Explorer I is reported using this novel antenna-receiver equipment. This installation, located near Bedford, Mass., enabled scientists to establish this satellite's period to a small fraction of a second. (a-1, b-3, c-1, d-1, e-0, f-Interferometer description)

3849. SCHAFER, C. W., "Automatic Direction Finder, Collins Radio Type DF-201, Evaluation of," Naval Air Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-157 641; 10 March 1958. ABSTRACT: The DF-201 is an airborne navigation equipment which covers the low/medium frequency radio range and broadcast frequencies between 90 and 1800 kc in 4 bands. The DF-201 is used to guide an airplane to a transmitting station or to obtain the relative bearing of a transmitting station. The system can also be used as a communications receiver. The DF-201 system showed approximately 30% improvement over the ARN-6 ADF system in regard to physical size, weight, and power consumption. Laboratory tests indicated that the DF-201 system has adequate sensitivity. The selectivity was better than that found in other types of ADF systems. Flight tests indicated that the system has bearing accuracy and maximum range characteristics that are comparable to those found in other ADF systems. (a-3, b-3, c-1, c-1, e-0, f-Evaluation report)

3850. ANONYMOUS, "Dead Reckoning Navigator (Automatic Radio Corrected)." Lear, Incorporated, Santa Monica, California, Preliminary Report, Contract No. DA 36-039-sc-72798, ASTIA No. AD-201 298; 14 March 1958. ABSTRACT: Not available. (a-4, b-, c-1, d-1, e-0, f-See Abstract No. 3717)

3851. ANONYMOUS, "Evaluation of UHF Ground-Based Automatic Direction Finder AN/CRD-6," Army Electronic Proving Ground, Fort Huachuca, Arizona, Interim Report No. 2, ASTIA No. AD-215 369; 15 March 1958. ABSTRACT: An evaluation was made of the ground-based UHF radio direction finder AN/CRD-6 used in conjunction with airborne UHF communications equipments. Tests were conducted to determine the technical value, effectiveness and capabilities of an Army employed ground-based direction finder in the AM/UHF portion of the frequency spectrum. It was concluded that the accuracy, response, automatic operation, sensitivity, the reliability of the AN/CRD-6 are adequate but that the weight and volume of the equipment is excessive for use by Army aviation. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

3852. KISHA, A., "Monopulse Antenna," Antenna Laboratories, Ohio State University Research Foundation, Columbus, Ohio, Contract No. AF 33(616)3353, ASTIA No. AD-157 012; 15 March 1958. ABSTRACT: An analysis was made of a phase comparison monopulse system consisting of 2 antennas operating in a sum, difference, and product combination. The 2 radiators were considered entirely separated. The phase comparison system received the same amplitude but the signals are combined in-phase or out-of-phase. The phase centers of the 2 antennas are displaced. Relations were derived among the following parameters which govern the antenna performance: (1) aperture distribution, (2) side lobe level, (3) angular sensitivity, (4) spacing between centers of the 2 antennas, and (5) aperture size. Results are presented in graphs and tables which show (1) the side lobe level as a function of sensitivity and of relative spacing, (2) sensitivity as a function of spacing, and (3) the optimum conditions. From these results, the distribution can be specified for a given side lobe level and relative sensitivity. The results were verified experimentally, and good agreement was achieved. (a-3, b-3, c-1, d-1, e-0, f-Description analysis)

3853. SMITH-ROSE, R. L., WILLIAMS, C., REDGMENT, P. G., STRONG, C. E., GARFIELD, W. L., HOPKINS, H. G., PRESSEY, B. G., EARP, C. W., COOPER-JONES, D. L., WATSON, D. W., HIRST, R. L., BAIN, W. C., BYATT, D. W. G., DEACON, D., ROSS, W., BELL, C. A., HAIGH, J. D., GODFRY, R. M., HAWKES H. W., JOLLIFFE, S. A. W., "Discussion on Range and Bearing Systems," at the IEE Convention; 28 March 1958. ABSTRACT: Discussion on four papers published in the same volume. See nos. 3842, 3843, 3846, and 3854 on Navigation Range and Bearing Systems. (a-4, b-1, c-1, d-5, e-487, f-Discussion)

3854. STRONG, C. E., "General Aspects of Short-Range Rho-Theta Systems," JIEE, vol. 105, Part B, Supplement No. 9, pp. 284-297. The Institution of Electrical Engineers, Paper No. 2578 R, March 1958. ABSTRACT: The paper starts with a recapitulation in simple terms of the principal processes used in rho-theta systems, namely azimuth transmission, distance measurement and direction finding. An outline is then given of the TACAN system, illustrating the application of the processes in an established system of particular present interest. Further illustrations are taken from V.O.R. technique with particular reference to an experimental system known as V.O.R.A.C. the main purpose of which was to investigate the possibilities of improving the accuracy of the V.O.R. system while maintaining compatibility with the system in current use. Finally it is suggested that the most general form of a rho-theta system would be one giving the distance and bearing indication both in the air and on the ground, and the paper ends with speculations on the application of secondary radar technique to such a purpose. A rho-theta system is a navigational aid of the kind which enables the position of an aircraft to be fixed with respect to a point on the ground by measurement of the distance and bearing of the aircraft with respect to that point. It is a single-site system in contrast to systems depending on reference to three or more widely spaced ground stations. (a-1, b-1, c-1, d-5, e-0, f-Survey)

3855. WELL, H. W., "Unusual Propagation at 40 MC from the USSR Satellite," Proc. IRE, vol. 46, no. 3, p. 610, March 1958. ABSTRACT: Recordings of signals from the first Soviet satellite were made at the Derwood Experimental Laboratory, Carnegie Institution of Washington, Department of Terrestrial Magnetism, from October 4 to October 25, 1957. The recording instrument was a conventional phase-switching interferometer, as used in radio astronomy, operating at 40.002 mc. Receiving antennas were folded dipoles spaced 11 wavelengths apart along an east-west line. These were changed on October 9 to a spacing of approximately 15 wavelengths along the axis of the satellite's orbit, that is, inclined 65° to the equatorial plane. The instrument was originally designed for use at 38 mc with a bandwidth of 150 kc but was hastily converted to monitor 40.002 mc shortly after the first announcement of the launching. Subsequent reductions in bandwidth of the receiver to about 3 kc were helpful in minimizing interference. Normal sensitivity was such that signals at the receiver of approximately 10^{-16} watts would saturate or drive the recording pen off-scale. The satellite signals were normally saturating except in a few isolated cases which may have been caused by receiver detuning. A movement of any signal source through the receiver's antenna pattern produces the well-known interference pattern with maxima and minima resulting from the addition or cancellation of the combined signals from the two antennas. (a-1, b-1, c-1, d-1, e-0, f-Observation)

3856. ZETZMANN, H. J., "Navigation Aids on Board Ships and Airplanes by Polar Navigation Methods," Zeit fuer Flugwissenschaften, vol. 6, no. 3, pp. 81-84; March 1958. ABSTRACT: This is a report of the meeting of the Committee for Radio Direction Finding, October 1957. (a-3 and 4, b-2, c-4, d-4, e-0, f-Informal meeting report)

3857. AKSENOV, V. I., "On the Scattering of Electromagnetic Waves from Sinusoidal and Trochoidal Surfaces of Finite Conductivity," Radiotekhnika i Elektronika, vol. 3, no. 4, pp. 459-466; April 1958. ABSTRACT: This problem has an obvious practical application as regards dispersion over the surface of the sea. The treatment is theoretical and assumes a surface that undulates in one direction only. An expression is derived for the dispersed field at a distance by using the vector form of the Kirchhoff integral. The results are applied by way of illustration to a sinusoidally undulating surface characterized by $L/a = 10$, $L/\lambda = 3.75$, $p = 0.2 + j\,0.05$, where L = period of undulation, a = amplitude of undulation, λ = wavelength of incident wave, $p = \sqrt{\mu^*/\epsilon^*}$, μ^* and ϵ^* being respectively the relative complex magnetic and dielectric permittivities of the dispersing surface. When the wave is incident perpendicular to the mean level of the dispersing surface, dispersion lobes occur with maxima at angles 0°, ±15.5°, ±32.2°, ±53.1°. The corresponding amplitudes are calculated separately for horizontal and vertical polarizations, the greatest intensity being in both cases in the fourth lobe. In the case of a trochoidal surface, only the dispersed wave returning in the opposite direction to the incident wave is considered. (a-3, b-2, c-2, d-2, e-0, f-Theory)

3858. AMIANTOV, I. N., AND TIKHONOV, V. I., "Effect of Fluctuations on Range-Finder Operation," Avtomatika i telemekhanika, vol. 19, no. 4, pp. 325-333; 1958. ABSTRACT: The paper deals with problems of measuring range errors caused by fluctuations, and with problems of stability of an automatic range-finder system. The system consists of a time modulator, time detector, and differential detector. The input voltage consists of the sum of the useful signal and of noise. Useful signals consist of pulses reflected from the target which, for simplification, are considered immobile, and, therefore, have a

repetition period of T_0. The moment of the appearance of the reflected pulse in relation to the main pulse is designated as T_R, and the start of the main pulse as T_n. The time modulator generates a pair of square strobe pulses. The task of the automatic tracking system consists in an accurate tracking of reflected pulses by the strobe pulses. The error signal depends on the difference $\Delta T_n = T_R - T_n$, and is obtained at the output of the time detector in the form of a pair of pulses with different areas. The time detector consists of two coincidence tubes, each one of which operates only under the simultaneous action of one of the strobe pulses and of the input signal. The difference of pulse areas at the output of the time detector, depending on ΔT_n, is measured by the differential detector and is converted into a constant voltage which controls the moment of appearance of strobe pulses. This constant voltage can be used as the output signal of the system. (a-1, b-2, c-2, d-2, e-952, f-Analysis)

3859. ANDERSON, L. J., "Tropospheric Bending of Radio Waves," Trans. Am. Geophys. Union, vol. 39, no. 2, pp. 208-212; April 1958. ABSTRACT: A simple and accurate method is presented for computing the refractive bending of radio waves in the lower 100,000 ft of the atmosphere. A given refractive-index profile is approximated by a series of straight lines (layers of constant gradient) and the incremental bending computed for each layer. The method is applied to the "standard" atmosphere, and total bending is plotted against the surface refractive index for various vertical angles of arrival from 0 to 1 radian. (a-1, b-1, c-1, d-1, e-0, f-Theory)

3860. BARTHEL, E. H., BATES, J. K., ET AL., "Airborne Electronic (Ferret) Reconnaissance Techniques," ITT Laboratories. Nutley, New Jersey, Interim Report No. 15, Contract AF 33(600)-27521, ASTIA No. AD-301 292; April 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3861. DRACHEV, L. A., "Measurement of the Variation of the Phase Path of a Signal Reflected from the Ionosphere," Pribory i Tekh. Eksper (USSR), no. 2, pp. 56-61; March-April 1958. ABSTRACT: The article describes and estimates the accuracy of an apparatus to measure the variation of the phase path of a signal reflected from the ionosphere caused by movements of large-scale inhomogeneities. The apparatus enables changes of the phase path by any number of wavelengths to be recorded with an accuracy of half a wavelength. Changing the indicator enables statistical phase fluctuations to be measured with an accuracy of ± 1°. (a-1, b-2, c-2, d-2, e-0, f-Descriptive evaluation)

3862. BECK, G. E., MOORHEN, C. N., HOUGHTON, P. A., FRASER, D. O., AND DURST, C. S., "Doppler Navigation," J. Inst. Nav., vol. 11, pp. 117-145, Discussion, pp. 146-149; April 1958. ABSTRACT: Papers as follows: (1) BECK, G. E., "Airborne Doppler Equipment," pp. 117-124. An account of the basic principles of Doppler navigation, including antenna patterns, presentation of data and various sources of error. (2) MOORHEN, C. N., "The Navigational Applications of Doppler Equipments," pp. 125-130. A description of operational procedures and the accuracy achieved in military aircraft. (3) HOUGHTON, P. A., "The Future Development of Doppler Navigation," pp. 130-137. Various possible improvements in equipment are described. These mainly concern the use of automatic computers to simplify the presentation of data. Experimental models of units are discussed. (4) FRASER, D. O., "Doppler and Civil Aviation," pp. 138-143. A discussion of accuracy requirements, and integration with other navigational aids. (5) DURST, C. S., "The Sea Surface and Doppler," pp. 143-145. Data on the frequency of occurrence of calm conditions in various sea areas, and of the dependence of the sea roughness on wind speed. (a-5, b-1, c-1, d-5, e-0, f-Miscellaneous papers pertaining to Doppler technique)

3863. KASPER, H. W., "Optimum Stacking Spacing in Antenna Arrays," QST, vol. 42, pp. 40-43; April 1958. ABSTRACT: Principles are outlined and general design information given in graphical form, relating spacing to source beamwidth. (a-5, b-1, c-1, d-1, e-0, f-Description and analysis)

3864. KOVALEV, V. P., "The Measurement of Phase Differences," Pribory i Tekh. Eksper., no. 2, pp. 3-11; March-April 1958. Translation in Exper. Tech. ABSTRACT: A review of the methods of measurement of phase differences between electrical signals is given. A summary of the properties of phasemeters of various types is presented which enables us to choose the method of measurement which is most suitable for the solution of the given practical problem. (a-1, b-1, c-1, d-2, e-0, f-Measurement techniques)

3865. HARRISON, C. W., "Theory of Inverted L-Antenna with Image," U.S. Army Signal Corps., Technical Memorandum No. 11-58(14); 8 April 1958. ABSTRACT: An approximate theory of an inverted L-antenna with image is developed, the principal objective being the evolvement of a formula for the driving point impedance of the structure. Using this result it is possible to solve several related antenna problems through employment of the principle of superposition of circuits. Examples of antennas amenable to analysis in this way include the top-loaded folded monopole and the electrically similar hairpin structure. (a-1, b-3, c-1, d-1, e-400, f-Theory and principles)

3866. PRASAD, S., "Current Distributions and Impedances of Corner-Driven Square Loop Antennas," Cruft, Laboratory, Harvard University, Cambridge, Massachusetts, Contract No. 186632, ASTIA No. AD-158 738; 10 April 1958. ABSTRACT: Square loop antennas driven in the zeroth-phase sequence (voltages in phase at all four corners) and the second-phase sequence (voltages alternately) in and out of phase at the corners) have been studied. The theoretical input admittances and impedances have been calculated for each phase sequence and for a simple superposition of the two phase sequences. Current distributions and input admittances have been obtained experimentally for the same superposition of the two phase sequences (a-1, b-3, c-1, d-1, e-0, f-Analysis)

3867. JONES, H. L., "The Identification of Lightning Discharges by Sferic Characteristics," 1958 Southwestern IRE Conference Proceedings, Sponsored by the San Antonio Section, pp. 82-86; 10-12 April 1958. ABSTRACT: Discovery of a new type of atmospheric by Jones and Hess in 1950 made possible the development of the present sferic-radar system for the tracking and identification of severe thunderstorm cells which sometimes develop into tornadoes. The development of the 150 kilocycle static direction finder at the Tornado Laboratory of Oklahoma State University has resulted in the identification of the "tornado oscillator" or "inner cloud discharge" that is characteristic of severe storms common to the Great Plains Area. The sferics network of the Air Weather Service, initiated and directed by Lt. Colonel E.J. Fawbush, was equipped with three AN/GRD1-A direction finders operating on a band in the neighborhood of 10 kilocycles. This network was first operated in the spring of 1954, and covered parts of Texas, Oklahoma, Arkansas and Kansas. As a result of the operations of this network during the tornado season of 1954, a significant discovery was made. As the intensity of a thunderstorm increased, the number of sferics per second from the thunderstorm increased to reach a peak value some 30 to 90 minutes before the time of formation of a tornado. Following the maximum value, the rate of sferic arrival decreased to a relatively small value just prior to tornado time. (a-5, b-1, c-1, d-1, e-470, f-Descriptive analysis)

3868. GEHRELS, E., "The Use of Doppler Shift for the Directional Resolution of Received Signals," Stanford University, Electronics Laboratory, Contract No. 225(24), Technical Report No. 32. See also Department of Commerce PB138549, ASTIA No. AD-161 326; 21 April 1958. ABSTRACT NO. 1: This dissertation describes a way in which two or more signals of the same radio frequency, but of a different direction of arrival, may be resolved by taking advantage of the above Doppler shift. In this case the received signal consists of the sum of the various individual signals, each having a superimposed frequency modulation whose characteristics depend on the direction of arrival of that particular signal component. By properly processing the composite signal the individual components can be separated, thus achieving directional discrimination analogous to that of a directional antenna. Because of this analogy, the rotating antenna system is called a "Doppler array." ABSTRACT NO. 2: A new principle was developed for the purpose of resolving multiple signals arriving from different directions in space. The principle and the theoretical properties are presented and the realizability of a system embodying the principle is demonstrated. The unconventional techniques encountered present special problems in circuit design which are discussed in detail. A thorough experimental demonstration of some of the critical operations including those not subject to exact prediction by theory is described. The principle of directional resolution using a moving antenna can be used to produce the equivalent of any antenna system and is really an extension of the sampling theorem to a space field problem. (a_1-3, a_2-1, b-3, c-1, d-1, e-0, f-Description)

3869. JEFFERSON, R. W., "Flight Test and Evaluation of Instantaneous Electronic Countermeasures Direction Finder AN/ALD-2(X-2)," Naval Air Test Center, Patuxent River, Maryland, Confidential Report, ASTIA No. AD-300 156L; 22 April 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3870. HANKS, H. C., JR., "Ferrite Radiators Shrink Missile

Antenna Systems," Electronics, vol. 31, no. 17, pp 49-51; 25 April 1958. ABSTRACT: Procedure for predicting approximate radiation pattern for ferrite elements in a microwave antenna system uses random balance technique. Results indicate that directivity property of ferrite elements permits ferrite arrays to provide half-power beam widths and side-lobe characteristics equal to those obtained with large conventional antenna systems. (a-5, b-2, c-1, d-1, e-0, f-Analysis)

3871. TRAVERS, D. N., MOORE, J. D., ET AL., "Direction-Finder, Radio, Shipboard Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Interim Report No. 27, Contract No. 64585, ASTIA No. AD-202 545L; 26 April 1958. ABSTRACT: The recent work performed toward the construction of a spinning three loop array is summarized in detail. The performance of the 500 cubic inch spaced loop is described with respect to effective height and pattern quality. It is concluded that it is feasible to construct a working model of this volume if the low effective height is acceptable. It is shown, however, that the effective height of a model of these dimensions is so low as to be of only limited value. It is also shown that raising the low frequency cutoff for the spaced loop, while simplifying the construction problem, offers very little help toward increasing the distance range of the antenna for reception of a specified signal. It is concluded, therefore, that for a final working model a volume greater, and probably much greater, than 500 cubic inches will be required. The performance of a 9000 cubic inch spaced loop antenna is summarized in detail with respect to pattern quality and effective height. It is shown that the effective height of this antenna is on the order of 25 db. above the 500 cubic inch model but still about 25 db. below the existing AN/SRD-7 HF loop at 2.0 mc., and approximately 6 db. below at 25 mc. It is shown that this effective height is probably sufficient for practical application. However, this volume is large for use with an AN/SRD-7 and for compactness, lower weight and simplicity, a lower volume is indicated. It is concluded, therefore, that the final volume should be determined in terms of operational requirements as specified by the Navy. Data is presented to facilitate this decision by indicating the relationship between volume and range at which a radiating source can be detected with 10° azimuthal resolution. The unwanted direct pickup in an AN/SRD-7 system has been determined approximately and compared to the maximum acceptable direct pickup for successful operation of a three loop array of the dimensions already mentioned. It has been determined that additional shielding will be required on the AN/SRD-7 receiver, the RF transmission line, and the nonreceiving portions of the antenna. It is concluded that the additional shielding required must be on the order of that afforded by solid copper conductor or copper screening. If such shielding is not provided, the existing AN/SRD-7 system would introduce enough direct pickup to cause excessive reciprocal error. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 3825)

3872. ANONYMOUS, "Countermeasures Direction-Finding Antenna," General Electronic Laboratories, Incorporated, Cambridge, Massachusetts, Report No. 1, Contract No. 72753, ASTIA No. AD-303 608L; 30 April 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3873. BEDNASH, C. S., AND CLIFFORD, V. F., "Direction Finder Group, UHF," Federal Telecommunication Laboratories, Nutley, New Jersey, Quarterly Report No. 3, Contract No. DA-36-039-sc-74839, ASTIA No AD-163 111; May 1958. ABSTRACT: Progress is reported on all major tasks. Each task consists of 4 phases: (1) review of mechanical and electrical problems, (2) experimental design work, (3) building and testing of prototype model, and (4) final design and test of engineering model. Reference is made to the following percentages of completion: tasks advanced to phase 5, 52%; tasks advanced to phase 3, 17.5%; to phase 2, 23.5% and to phase 1, 7%. Considerable effort was expended on the azimuth indicator. The prototype model of the antenna was built and the final version of the captive joint was completed. (a-3, b-3, c-1, d-1, e-0, f-See Abstract No. 3831)

3874. BRAUDE, S. I., "Distribution of Scattering Elements for Propagation of Radio Waves over an Agitated Sea Surface," Radiofizika, vol. 1, no. 3, pp. 25-29; May 1958. Translation OTS 59-13, 545, JPRS 1612-N, available from Office of Technical Services, U.S. Dept. of Commerce, Washington, D C. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Propagation statistics)

3875. KENT, G. S., AND BYRD, W. H., JR., "Service Test of UHF Direction-Finder Set, AN/TRD-12," Army Aviation Board, Fort Rucker, Alabama, ASTIA No. AD-201 911; May 1958. ABSTRACT: The AN/TRD-12 (225.0 to 399.9 mc) ground-based UHF receiver-indicator is designed to provide instantaneous visual direction-finding information from aircraft radio signals. Tuning is normally accomplished by means of a remotely controlled device which selects any one of 20 preset frequencies. Any one of 1750 channels can be selected manually. Results of test indicated that the AN/TRD-12 was unsuitable for Army use. (a-3, b-3, c-1, d-1, e-0, f-0)

3876. POWELL, C., "Dectra: A Long-Range Radio-Navigation Aid," J. Brit. IRE, vol. 18, pp. 277-290, Discussion, pp. 291-292; May 1958. ABSTRACT: The tracking and ranging functions of the system are discussed with reference to the time-sharing technique on which the tracking pattern is based. The receiving and display equipment is described and details are given of the transmitting stations which are common to the Dectra and Decca services. Accuracy and performance are considered. (a-3, b-1, c-1, d-5, e-0, f-Description)

3877. RUGARI, A. D., "Target Generator for Alignment of VHF and UHF Direction Finding Equipment (Signal Generator SG-136/U)," Rome Air Development Center Griffiss AFB, New York, ASTIA No. AD-148 715. See also Department of Commerce PB135312; May 1958. ABSTRACT: Signal Generator SG-136/U, a portable battery operated transmitter used for alignment of Azimuth Indicator Units of Direction Finding Equipments operating in the UHF and VHF bands, is described. Theory of operation, specification requirements, test procedures and results of First Article tests of the Signal Generator are included. (a-1, b-3, c-1, d-1, e-0, f-Description)

3878. ANONYMOUS, "Electronic Scanning Symposium," USAF Cambridge Research Center, Bedford, Mass., AFCRL-TR-58-145(I), ASTIA No. AD-152 409; 29 April-1 May 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Symposium report)

3879. FRANKFORT, M., HARRIS, B., ET AL., "Electronic Warfare Studies, Analysis of Jammer Location Systems," New York University College of Engineering, New York, Scientific Report, Contract No. AF 30(602)1655, ASTIA No. AD-148 799; 1 May 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3880. STANNER, W., "Methods and Installations for Long-Distance Radio Navigation," Elektrotech. Z., Ed. A., vol. 79, pp. 322-329; 1 May 1958. ABSTRACT: A review of the principal present-day systems including Loran, Consol and Decca. (a-5, b-2, c-4, d-4, e-0, f-Summary)

3881. KIFT, F., "Single Hop Propagation of Radio Waves to a Distance of 5300 km," Nature, vol. 181, pp. 1459-1460; 24 May 1958. ABSTRACT: The Appleton and Beynon equations, for the reflection of radio waves from ionospheric layers, have been solved for a wide range of possible conditions, using a digital computer. These calculations support the hypothesis of a recent note that single-hop propagation has been recorded over the 5300 km path between Slough and Ottawa. (a-3, b-2, c-1, d-5, e-0, f-Analysis)

3882. ANONYMOUS, "Army Electronic Proving Ground Fort Huachuca Ariz Evaluation of a Ground-Based FM/VHF Automatic Direction Finder AN/TRD-10," Army Electronic Proving Ground, Ft. Huachua, Ariz., ASTIA No. AD-210 621; June 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

3883. ANONYMOUS, "Marconi Doppler Navigator," Wireless World, vol. 64, pp. 260-261; June 1958. ABSTRACT: Further technical details are given and performance during a demonstration flight is described. (a-3, b-2, c-1, d-5, e-0, f-Description)

3884. BALOGH, P., BENDER, R. M., ET AL., "Extremely High Altitude Ferret Reconnaissance Study," Haller, Raymond, and Brown, Incorporated, State College, Pennsylvania, Quarterly Report No. 2, Contract No. AF 33(616)5471, ASTIA No. AD-300 325; June 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3885. BAUR, K., "Improvement of Readings on a Two-Channel Visual Direction Finder," Telefunken Ztg., vol. 31, pp. 97-99. See Canadian Translation No. 869; June 1958. ABSTRACT: It is shown mathematically that integration of the output of the receivers and application of appropriate time constants in the output circuits can reduce the effects of some interference encountered in short-wave direction finders. With crt displays this results in more accurate readings. (a-2, b-2, c-4, d-4, e-0, f-Mathematical analysis)

3886. KANAYA, S., AND UENO, K., "Propagation Mechanism of High Frequency Waves Related to the Annular Eclipse of April 19, 1958," Rep. Ionosphere Research Japan, vol. 12, no. 2, pp. 188-195; June 1958. ABSTRACT: Not available. (a-4, b-1, c-6, d-6, e-0, f-Observation and experiment)

3887. KITCHEN, F. A., AND JOY, W. R. R., "Some Effects of the Fine Structure of the Ionosphere on Transmissions Received from the Russian Earth Satellite 1958," Nature, vol. 181, p. 1759; 28 June 1958. ABSTRACT: A series of simultaneous direction-finding and Doppler frequency-shift measurements has been made on the radio transmissions from the Russian satellite 1958δ, on a frequency of 20.005 Mc/s, with the initial object of determining the parameters of local tracks, and hence those of the orbit. As previously discussed, these techniques enable the following parameters to be derived, in principle, from observations made during one local transit: velocity, plan and slant ranges (hence the height of the satellite), and bearing of the sub-satellite point at the instant of closest approach (hence track-heading of the satellite at this point). During the course of precise observations on 1958δ, however, some interesting anomalies were observed in the Doppler measurements. These confirmed the existence of similar effects previously noted in the case of observations on 1957α and 1957β, when less-accurate measuring techniques were available. In the system at present in use, all information on bearing, Doppler frequency and time is recorded synchronously on separate channels of a multi-channel tape recorder. An Essen ring quartz-crystal oscillator operating at 100 kc/s with a frequency drift of less than +2 parts in 10^{10} per day was used to provide the time reference throughout the system. It was also used to drive a precise frequency synthesizer to generate a local reference signal for comparison with the signal received from the satellite, at radio-frequency. Errors in the frequency measurements originating within the receivers were thus eliminated. (a-1, b-2, c-1, d-5, e-0, f-Observation and analysis)

3888. LOH, S. C., AND WONG, J. Y., "Radiation Field of an Elliptic Loop Antenna with a Constant Current," Can. J. Phys., vol. 36, pp. 672-676; June 1958. ABSTRACT: Not available. (a-4, b-1, c-1, d-7, e-0, f-Description)

3889. MARCOU, R. J., PFISTER, W., AND ULWICK, J. C., "Ray-Tracing Technique in a Horizontally Stratified Ionosphere Using Vector Representations," J. Geo. Phys., vol. 63, no. 2, p. 301; June 1958. ABSTRACT: Vector expressions are derived for tracing oblique ray paths, taking into account the full effect of the earth's magnetic field. The method is an extended analytical treatment of Poeverlein's two dimensional case based upon crystal optics. In particular, the unit vector S in the direction of the ray and the vector expressions for the equivalent path of the wave packet and the group refractive index are derived. A method for high speed computers is described for ray tracing in a horizontally stratified ionosphere for determining, by an iteration process, the index of refraction and wave normal direction, and for determining electron-density distributions from rocket data. (a-1, b-1, c-1, d-1, e-0, f-Descriptive theory)

3890. NEWMAN, M. M., STAHMANN, J. R., AND ROBB, J. D., "A.D.F. Interference Blanker Development," Trans. IRE, vol. ANE-5, no. 2, pp. 86-91; June 1958. ABSTRACT: Interference blankers have been developed to give improvement ratios of the order of 1000 in the presence of severe precipitation static of the order of 15 × 10^4 pulses/sec. Recently the blanking technique has been applied to A.D.F. receivers with the objectives of simplification, reduced size and weight, improved sensitivity in the presence of interference, reduced intermodulation distortion, maintenance of the relative phases of the sense and loop signals, and general compatibility with A.D.F. receiver operation. (a-2, b-1, c-1, d-1, e-0, f-Description)

3891. SCHMUCKER, G., "The Telefunken Short-Wave Visual Direction Finder," Telefunken Ztg., vol 31, pp. 90-97, Canadian Translation No. 885; June 1958. ABSTRACT: A concise description of a commercial product stressing mainly good technical points. The equipment housed in a console, works with a 6-mast Adcock aerial in the range 1.35-25.2 Mc/s. It has two receiving channels for the bearing components and displays the results on a crt. The receivers have several refinements for balancing, gain, and phase correction and reducing the influence of interference on bearing accuracy. There are facilities for recording the results photographically and on magnetic tape. (a-2, b-2, c-4, d-4, e-0, f-Description)

3892. TROOST, A., "The Physical Properties of Various Cathode-Ray Direction Finders for Short Waves," Telefunken Z., vol. 31, pp. 84-89. English Summary, pp. 135-136; June 1958. ABSTRACT: A comparison of the five basic D/F systems in present-day use: The answers to questions on suitability and operational facilities are given in tabular form, showing the relative advantages of the two-channel system. (a-3, b-2, c-4, d-4, e-0, f-Survey and comparison)

3893. ANONYMOUS, "Wullenweber-Type Antenna Array," Electrical Engineering Research Laboratories, University of Illinois, Urbana, Illinois, Interim Report, Contract No. 64723, ASTIA No. AD-212 858; 1 June 1958. ABSTRACT: An antenna array is to be developed for a Wullenweber-type radio direction finder. Efforts are concerned with the fabrication and installation of the array and with the evaluation of the direction finding system with this array and suitable terminal equipment. Progress is reported on the site development, facilities constructed, antenna array and terminal gear, array pattern computations, and instrumentation for the evaluation. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3894. GABLER, H., AND WACHTLER, M., "A New Method of Component Determination in Radio Direction-Finding for Coherent Waves," Elektrotech. Z., vol. 79, pp. 383-388, Canadian Translation No. 819; 1 June 1958. ABSTRACT NO. 1: The three ellipses produced by three suitably spaced crossed-loop antennas with a two-channel cathode-ray D/F equipment are superimposed on the screen. Bearings free from night effect can be obtained even under unfavorable site conditions. ABSTRACT NO. 2: A new method of analysis of the displayed ellipse is given for a D/F assembly consisting of three crossed frame aerials and a double channel night-effect-free equipment. Such an equipment offers the possibility of accurate D/F measurements over an unfavourable terrain. ABSTRACT NO. 3: A new method is reported by which it becomes possible to obtain bearings free from night effects by the use of three crossed-loop antennas in conjunction with a twin-channel visual direction finder. This is done by analysing the screen readings into their components. In principle such an arrangement opens the way to the erection of D/F equipment on terrain which is unfavorable from the point of view of D/F engineering. (a_1-5, a_2-2, a_3-Canadian translation, b-1, c-4, d-4, e-108, f-Canadian translation available. See Abstract No. 3983)

3895. ANONYMOUS, "Arctic Test of AN/ARN 59 Automatic Radio Direction Finder," Army Arctic Test Board, Fort Greely, Alaska, Project No. ATB 1357, ASTIA No. AD-208 884; 2 June 1958. ABSTRACT: The AN/ARN-59 automatic radio direction finder (ADF) was tested for use in army aircraft under arctic winter conditions. The AN/ARN-59 is a lightweight, airborne radio compass system designed to provide automatically a visual indication of the direction from which an incoming RF signal is being received, and to provide the aural reception of AM signals. Provisions are incorporated for loop operation. The frequency range is from 190 to 1750 kc. The physical and electrical characteristics of the AN/ARN-59 were determined. The equipment was effective as an ADF at distances up to 80-naut mi from the station. The antenna mode was effective up to 80-naut mi, but was generally less sensitive than the compass mode. Normal operation was experienced after the AN/ARN-59 was cold-soaked 25 to 27 hr at ambient temperatures ranging between -15°F and -39°F. Mutual interference between the AN/ARN-59 and other installed aircraft electronic equipment was not encountered. The AN/ARN-59 was determined to be suitable for use in army aircraft under arctic winter conditions. (a-3, b-3, c-1, d-1, e-0, f-Test report)

3896. HORNER, F., AND KHASTGIR, S. R., "Polarisation of Atmospherics," Nature, vol. 181, pp. 1678-1679, 1679-1680; 14 June 1958. ABSTRACT: The interpretation of a complex type of trace obtained by Khastgir with a twin-channel cr direction-finder receiving atmospherics is questioned by Horner, who believes that the record can be accounted for in terms of the ringing of the tuned circuits of the two amplifiers connected to the crossed-pair of loop aerials on reception of a ground-wave and the echo received after only one ionospheric reflection. Horner therefore doubts the information regarding the polarisation of multiple echoes deduced by Khastgir. In his reply, Khastgir refutes Horner's interpretation of the particular record considered, and maintains that a full interpretation of such complex patterns must consider both the ringing of the tuned circuits in the two amplifiers, and the polarisation of the ionospheric echoes. (a-3, b-2, c-1, d-5, e-0, f-Theory)

3897. ANONYMOUS, "Results of New Evaluation on Field Change No. 1 to the AN/SRD-7, Submitted by Stewart-Warner Electronics, Chicago, Illinois," New York Naval Ship Yard, Material Laboratory, Supplementary Report; 17 June 1958. See also Department of Commerce PB140492. ABSTRACT: Not available. (a-3, b-3, c-1, d-1, e-0, f-Modification evaluation report)

3898. LEE, R. P., HAYES, M. M., AND HOLLOMAN, T. W., "Bi-Cotar Error Contour Curves," White Sands (Proving Ground), New Mexico, Special Report, ASTIA No. AD-202 194; 23 June 1958. ABSTRACT: An outline of a data reduction procedure is presented for a two-station COTAR system (BI-COTAR), using a rigorous least squares solution. It contains contour curves of equal mean error in selected planes for each of three base-lengths. (a-3, b-3, c-1, d-1, e-0, f-Description)

3899. FINK, C., "Modification Kit MD-383( )/TRD," Litton Industries, College Park, Maryland, Quarterly Report No. 3, Contract DA 36-039-sc-74901, ASTIA No. AD-201 185; 30 June 1958. ABSTRACT: The final design of all electrical components for Bands, A, B and C has been effected. All components including dipoles, reflectors, directional couplers and tapers for the prototype unit have been tested. Preliminary assembly of the Band A, B and C component boxes has been completed and checks of amplitude and phase distribution at the antenna terminals have been made. In addition, overall electrical checks have been made of the component boxes and dipoles assembled as a unit. Satisfactory performance has been achieved throughout. Final design of the target transmitter cavity and circuitry has been completed and production drawings are in the process of being made. Final drawings of the target transmitter mast and Valentine antenna have been completed and fabrication started. A major effort during this reporting period has been the final mechanical engineering design. Effort has been devoted to finalizing the design of the antenna mounting structure, mast and TR box to permit mounting combinations of minimum weight and wind loading and for ease of handling on the ground. (a-1, b-3, c-1, d-1, e-0, f-Modification)

3900. BEDNASH, C. S., AND CLIFFORD, V. F., "Direction Finder Group, UHF," ITT Laboratories, Nutley, New Jersey, Quarterly Report No. 4, Contract No. DA 36-039-sc-74839, ASTIA No. AD-201 726; July 1958. ABSTRACT: Most of the problems associated with the project are solved, and the program now will consist of the final assembly of the engineering model and conducting all of the required tests to determine that the unit fully complies with the specifications. See also AD-163 111. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3873)

3901. KOCH, R. F., LOWMAN, R. V., AND SAFFITZ, I. M., "Unattended Electronic Ferret Reconnaissance Set AN/DLD-2(XA-1)," Airborne Instruments Laboratory, Incorporated, Mineola, New York, Final Report, Contract No. AF 33(600)32145, ASTIA No. AD-300 689; July 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3902. MANNING, L. A., "Report on URSI Commission III, Ionosphere Radio Propagation," Proc. IRE, vol. 46, no. 7, pp. 1362-1366; July 1958. ABSTRACT: The study of ionospheric radio propagation and the physics of the outer atmosphere are inherently international. The ionosphere knows no national or continental boundaries, and the radio signals that it bends back to earth travel from one side of our globe to the other. Cooperation between the research workers and the users of the ionosphere throughout the world is more than desirable - it is quite essential. Thus it is natural that the commission dealing with these topics should be the largest in URSI. At the Twelfth General Assembly, the foremost workers in the scientific study of the ionosphere gathered from throughout the world to interchange the results of their work, and to formulate resolutions and recommendations for future action. These recommendations covered such topics as fields of study in need of further support, technical symposia that should be organized, the desirability of continuing certain observing stations in operation after the IGY, and the need for financial support of workers at the IGY data centers after the IGY is over. It is expected that these recommendations of URSI will carry considerable weight with those bodies empowered to act in these fields. (a-1, b-1, c-1, d-1, e-0, f-Report)

3903. WONG, T. Y., "Measured Self-Impedance of a Dipole Antenna near a Conducting Cylinder of Elliptical Cross-Section," Can. J. Phys., vol. 36, pp. 855-857; July 1958. ABSTRACT: Not available. (a-4, c-1, d-1, d-7, e-0, f-Theory and analysis)

3904. ANONYMOUS, "Direction Finding Antenna System," Pickard and Burns, Incorporated, Needham, Massachusetts, Final Report, Contract No. 57495, ASTIA No. AD-301 258; 15 July 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3905. WALDO, J. E., HOCKENSMITH, R. P., AND SMITH, C. J., "Modification Kit MK-383( )/TRD for Direction Finder Group OA-1034 (XE-1)/TRD," Litton Industries, College Park, Maryland, Quarterly Report No. 4, Contract No. DA 36-039-sc-74901, ASTIA No. AD-206 478; 15 July 1958. ABSTRACT: The prototype system for Bands A, B, and C was completed and tested, mounted on an AB-275/U Mast with Pedestal. The electrical requirements for A, B, and C bands were met, but the electrical requirements for D and E bands were not met and require additional effort. The target transmitter, antenna, and mast were completed and tested and the preliminary instruction book was completed. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3899)

3906. PURCELL, J., AND GRIECO, L., "Submarine Direction Finding Antenna for AN/BLR-1 System, Bands IV and V," I.T.E. Circuit Breaker Company, Philadelphia, Pennsylvania, Final Report, Contract NObsr 71349, ASTIA No. AD-301 350; 17 July 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3907. TRAVERS, D. N., COKER, Q. W., ET AL., "Direction-Finder, Radio, Shipboard Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract NObsr 64585, ASTIA No. AD-206 568; 26 July 1958. ABSTRACT: The work performed toward the construction of a spinning three-loop antenna is summarized in detail. The final minimum volume for the spaced loop portion was set at 4500 cubic inches, a figure which meets specified operational requirements with respect to sensitivity. An experimental three loop antenna was constructed in accordance with three requirements using a modified AN/SRD-7 system for the range of 2 to 32 megacycles. This system is now under test and study; the most recent performance results are summarized. (a-1, b-3, c-1, d-1, e-1000, f-Development reports. See Abstract Nos. 3871 and 3825)

3908. BAILEY, A. D., AND WEBB, H. D., "Tactical Direction Finding Study," Electrical Engineering Research Laboratories, University of Illinois, Urbana, Illinois, Semiannual Report No. 2, Contract No. DA-36-039-sc-74898, ASTIA No. AD-206 836; 31 July 1958. ABSTRACT: Using a modified equation for the traveling-wave antenna, some calculations were made on the Illiac for several values of frequency, relative velocity, attenuation, and wire length. Curves are presented which were plotted from the calculated data, and significant deductions from the curves are discussed. A nine-element sector-type terminated antenna, with elements 250 ft long, was set up and studied experimentally over a frequency range of 2-10 mc. Measurements were made with a target transmitter about a mile away and with a receiver switched from one element to another. The measured results indicate that an RDF set using this sort of antenna is feasible. The terminating impedance is not critical, but for the wires 1 ft above the ground about 400 ohms is recommended. A direction finder using this sort of antenna array is proposed. Curves plotted from calculated data are presented to show the feasibility of averaging bearings from an ensemble of small aperture RDF sets. For a given angular separation and amplitude of an interfering signal compared to a desired signal, it is shown that there is an optimum distribution for the ensemble. In a practical application it may be possible to optimize a distribution on the basis of most probable values of interfering signal parameters. See also AD-159 744. (a-1, b-3, c-1, d-1, e-420, f-Study report)

3909. ANDERSON, S. R., ET AL., "Preliminary Tests of a Precision VHD Omnirange," Civil Aeronautics Administration, Technical Development Center, Indianapolis, Indiana, Technical Development Report No. 355; August 1958. See also Department of Commerce PB-151317. ABSTRACT: This report presents the theory and results of the preliminary development and testing of a new precision VHF omnirange in which omnibearing information is produced by radiating, in effect, a rotating 10-lobe radio-frequency sideband pattern in contrast to the rotating 2-lobe pattern of a conventional omnirange. Theoretically, a 5 to 1 improvement is possible in bearing accuracy and substantial reduction of course scalloping caused by reflecting objects can be effected. An experimental model of the precision omnirange, using 21 loops, was installed at the CAA Technical Development Center, Indianapolis, Indiana. The measured bearing accuracy was plus or minus 0.35°. The maximum course scalloping caused by reflections from a horizontal wire 200 feet in length and 30 feet high was 30.6 per cent of the scalloping associated with a conventional 4-loop omnirange at the same site. Later, measurements of course scalloping caused by reflections from groups of trees were made at a decommissioned five-loop omnirange site at Dayton, Ohio, using the same experimental equipment. The maximum course scalloping at this site was the same for both antenna systems; however, the azimuthal area of scalloping on the precision omnirange was only 27.4 per cent of the area of scalloping on the 5-loop omnirange. On radial flights, a reduction in course bends varying from 2 to 1 to 6 to 1 was measured on

the precision omnirange. Polarization errors measured in flight were negligible. (a-3, b-3, c-1, d-1, e-0, f-Test report)

3910. BRUECKMANN, H., "Suppression of Undesired Radiation of Directional H.F. Antennas and Associated Feed Lines," Proc. IRE, vol. 46, no. 8, pp. 1510-1516; August 1958. ABSTRACT: An analysis of the situation in point-to-point radio communication circuits at frequencies below muf with respect to radiation in undesired directions brings to the fore some aspects which are useful as guide lines in aerial research, design, and application engineering. In many cases, the interference experienced in operating receivers in the high-frequency range can be attributed primarily to the relatively high side lobes of the radiation pattern of rhombic aerials. Progress has been made in suppressing these side lobes through the development of arrays employing nonuniform amplitude distributions and, more recently, through the advent of modified horn-type aerials. Other sources of interference which are usually overlooked are associated with balanced open-wire lines which are not operated properly. Recently, it has become feasible to replace these lines by coaxial cable using broad-band balun transformers. (a-2, b-1, c-1, d-1, e-0, f-Analysis)

3911. CATH, P. G., "Three Methods of Nonlinear Processing for Direction Finding," Engineering Research Institute, University of Michigan, Ann Arbor, Michigan, Contract No. DA 36-039-sc-63203, ASTIA No. AD-204 168; August 1958. ABSTRACT: Three systems employing non-linear signal processing to reduce the physical size of a directive antenna array are compared with a linear additive array for the purpose of direction finding. The three systems are: (1) a time-averaged product system; (2) an enhanced phase system; and (3) a correlation system. Although the 3 non-linear systems produce exactly the same lobe pattern as the (equivalent) linear array with a single incoming radio wave, systems 1 and 2 fail to separate two waves of slightly different directions, which can be resolved by the equivalent linear array. The effect of random noise on these systems is considered, but these considerations do not lead to general conclusions suitable for comparison of these systems with the linear additive array system. It is concluded that narrow lobe patterns can be obtained for single arriving radio waves, with antenna arrays that are greatly reduced in size, at the cost, however, of a large increase in system complexity. (a-1, b-3, c-1, d-1, e-359, f-Theory)

3912. KNAPPE, W., "The Radiation Field of the Delta Aerial, a Long-Wire Aerial with Vertical Main Beam," Frequenz, vol. 12, pp. 261-267; August 1958. ABSTRACT: The field distribution is calculated for a receiving antenna using a number of simplifying assumptions, such as a plane and perfectly conducting earth. This type of antenna has characteristics similar to those of a vertical rhombic antenna but erection costs are lower. (a-3, b-2, c-4, d-4, e-0, f-Theory)

3913. MILLMAN, G. H., "Atmospheric Effects on V.H.F. and U.H.F. Propagation," Proc. IRE, vol. 46, no. 8, pp. 1492-1501; August 1958. ABSTRACT: This paper is mainly concerned with the effects of the troposphere and ionosphere on the propagation of vhf and uhf radio waves. Tropospheric refractive index profiles and ionospheric electron density models representative of average atmospheric conditions are presented. Mathematical relationships are derived for calculating refraction effects, time delays, Doppler errors, polarization changes, and attenuation experienced by radio waves traversing the entire atmosphere. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3914. RUST, N. M., "Doppler Effect in Radio and Radar," Wireless World, vol. 64, pp. 304-307; July 1958, pp. 373-377; August 1958. ABSTRACT: The general principles of the Doppler effect are explained; it is shown how directional discrimination can be obtained using phase-sensitive detectors. Various practical applications are described. (a-5, b-2, c-1, d-5, e-0, f-Doppler principles)

3915. TRAVERS, D. N., MOORE, J. D., AND DONALDSON, W. L., "Performance of a Model AN/SRD-7 Shipboard Radio Direction Finder for Single-Sideband Suppressed Carrier Transmissions," Southwest Research Institute, San Antonio, Texas, Report No. 3, Contract No. 64585, ASTIA No. AD-206 569; 1 August 1958. ABSTRACT: The performance of the Model AN/SRD-7 shipboard radio direction finder in the presence of voice modulated single-sideband suppressed carrier transmissions is described. The test procedure and target transmitter are discussed, and limitations of the tests are described. Typical D/F patterns obtained from the equipment, and the identification of voice modulated single-sideband suppressed carrier signals with this equipment are discussed. It is concluded that the Model AN/SRD-7 shipboard direction finder can be used to determine the direction of arrival of single-sideband suppressed carrier transmissions. See also AD-303 498. (a-1, b-3, c-1, d-1, e-1000, f-Description)

3916. ANONYMOUS, "Antenna System for the ARD-9 and ARD-10," Microwave Radiation Company, Incorporated, Gardena, California, Contract No. AF 33(600)31106, ASTIA No. AD-301 460; 6 August 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3917. STALDER, J. J., "Improved Airborne Direction Finder," New York University College of Engineering, New York, Quarterly Report No. 1, Contract DA 36-039-sc-75074, ASTIA No. AD-204 834; 7 August 1958. ABSTRACT: The purpose of this program is development of an automatic airborne direction finder which employs identifying amplitude modulation to establish loop antenna null position. This report is concerned primarily with analytical evaluation of some basic components required for generation of loop antenna control signals based upon received modulation. A study of voltage controlled oscillators is presented with consideration given to applicability for use in automatic phase control circuits. Various coherent detector types are evaluated particularly with regard to generation of ambiguous outputs by unwanted signals. It is concluded that reactance controlled oscillators, multivibrators, balanced detectors and switching detectors are most suitable for development. (a-1, b-3, c-1, d-1, e-0, f-Analytical evaluation)

3918. LINDSAY, J. E., "Research on New Types of ECM and DF Aircraft Antenna Systems for the Frequency Range 50-1000 Mc," Denver Research Institute, Denver, Colorado, Contract No. 58-314-c, ASTIA No. AD-203 732; 20 August 1958. ABSTRACT: An analysis for the far field of a filamentary loop antenna with non-uniform current distribution is presented. In order to obtain a possible current distribution an analogy between a circular transmission line and a parallel wire transmission line is made. This analogy yields a standing wave of current on the antenna similar to that found on a lossy parallel wire line. Considerable simplification results from considering only the far field of the antenna. Under these conditions the differential expressions for magnetic flux density are set up and the resulting integral equation is solved. The solutions give the magnetic flux density and electric field intensity at a distant point from the antenna. Loops with uniform current and loops with sinusoidal current distributions are shown to be special cases of the general solution. To verify the validity of the assumed current distribution the experimental patterns of a loop 1λ long are compared with calculated patterns. Results indicate that the field solutions are probably applicable to loops many wavelengths long. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

3919. ANONYMOUS, "VLF Antenna System," Edo Corporation, College Point, New York, Report No. 4785, Contract No. 77500, ASTIA No. AD-306 653L; 22 August 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3920. JACOBSON, M. J., "Correlation of a Finite Distance Point Source," Rensselaer Polytechnic Institute, Troy, New York, Contract No. 59109, ASTIA No. AD-202 292; 25 August 1958. ABSTRACT: A 2 receiver correlation system intended to process signals from point sources at a large distance from and in a common plane with the receivers will give a predicted source direction which is generally different from the actual source direction when the source distance from the receivers is not large. The exceptions are broadside or end-fire sources for which the predicted and actual directions are equal. Apart from these cases, the predicted direction is always closer to broadside than the actual direction. Other results include the fact that a given predicted direction corresponds to a source location at any point on a corresponding hyperbolic arc. (a-1, b-3, c-1, d-1, e-0, f-Description)

3921. ANONYMOUS, "Light Weight UHF Direction Finder (AN/GRD-11)," Servo Corporation of America, New Hyde Park, New York, Final Report, Contract No. AF 30(602)1485, ASTIA No. AD-148 990; 29 August 1958. ABSTRACT: This report describes the general theory, design principles and practical design problems relating to UHF Doppler direction finders. An experimental UHF D/F was developed during this project. This equipment, designated AN/GRD-11, is described in detail. Performance data obtained with the experimental model are presented. It is concluded that the UHF Doppler D/F exhibits significant inherent advantages over other forms of D/F and it is recommended that a production design be initiated. The basic features and practical improvements needed in operational versions of this equipment are outlined. Performance data on an advanced design are appended. (a-1, b-3, c-1, d-1, e-0, f-Description)

3922. DOMINICI, P., "Backscatter Sounding Data on 22.3 Mc/s Obtained at Torrechiaruccia (S. Marinella, Roma) from February 1, 1958 to August 31, 1958," Centro Radioelettrico Sperimentale "C Marconi," Rome, Italy. ABSTRACT: Not available. (a-4, b-2, c-9, d-9, e-0, f-Observation)

3923. ANONYMOUS, "New V.H.F. Direction-Finding Equipment," Brit. Commun. Electronics, vol. 5, p. 681; September 1958. ABSTRACT: A brief description is given of automatic equipment using a rotating Adcock antenna. The operational range is about 100 miles for aircraft flying at 10,000 ft and radiating 5 watts. (a-5, b-2, c-1, d-5, e-0, f-Description)

3924. BROWN, J., "A Generalised Form of the Aerial Reciprocity Theorem," Proc. IEE, Part C, vol. 105, pp. 472-475; September 1958. ABSTRACT: The reciprocity theorem which relates the transmission and reception properties of an aerial is extended to give information on the phase and amplitude of the signal received by the aerial for an incident plane wave of any polarization. The paper includes a rigorous proof based on the Lorentz reciprocity theorem for electromagnetic fields. (a-1, b-1, c-1, d-5, e-0, f-Theory)

3925. BROWN, J., "A Theoretical Analysis of Some Errors in Aerial Measurements," Proc. IEE, Part C, vol. 105, pp. 343-351; September 1958. ABSTRACT: The reciprocity theorem is used to derive an expression for the power received by one antenna as a result of transmission from a second similar antenna at any distance from the first. Under conditions of antenna measurements the size of the receiving antenna can influence the errors in measured radiation patterns and power gains. The errors differ from those predicted by diffraction theory. (a-1, b-1, c-1, d-5, e-0, f-Theory. See preceding abstract)

3926. HAYDEN, E. C., "Some Basic Problems in the Determination of the Direction of Arrival of Radio Waves," Technical Report No. 11, Supported by Office of Naval Research and Bureau of Ships, Contract No. Nonr 1834(02), Project No. 371-161, ASTIA No. AD-204 476, University of Illinois, Urbana, Illinois; September 1958. ABSTRACT: The most persistent and difficult problem in radio direction finding has been measurement of the direction of arrival of waves under circumstances where multipath propagation of the signal is possible. In the HF band, the ionosphere plays a predominant role in the propagation of radio waves, and in this region several mechanisms exist which promote splitting of a radio signal into numerous components. Under suitable circumstances, several of the components will arrive at a receiving site, each over its own path, and each with its own direction of arrival. It would be of value to have a more thorough knowledge of the characteristics of the individual signal components. The principal purpose of this investigation was the experimental evaluation of some of these characteristics for signals traveling in an east to west direction between particular fixed transmitting and receiving sites separated by 450 km. Of particular interest were the directional characteristics of signal components propagated in the various modes. By the employment of a special double-pulse transmitted signal, and receiving equipment capable of measuring and displaying simultaneously bearing, polarization, and mode structure, it proved possible to "take apart" a multicomponent arriving signal and study the behavior of its components. The frequency used was 5155 kc. A substantial amount of information was obtained on the short-time and the long-time directional fluctuations of signals propagated in two modes, the one-hop sporadic E-layer mode and the one-hop F-layer mode, including information on the behavior of the individual magneto-ionic components of the latter mode. In addition, a smaller amount of information was obtained on the behavior of signals propagated in three other modes. One of the more surprising observations was the relative stability of the directional properties of signals propagated in the sporadic E mode. Directional variations, both on a short-time and a long-time basis, were the least for signals in this mode. The two magneto-ionic components of the F-layer mode were next in order of stability, but were appreciably more variable. In addition these latter components showed persistent deviations from the great circle bearing, the ordinary component arriving, on the average, about 9° to the north, and the extraordinary component, on the average, approximately 4° to the south. Some observations were also obtained on widely-deviated auroral and sporadic E modes, both on the system described above and on a wide-aperture Wullenweber direction finding system. (a-1, b-3, c-1, d-1, e-0, f-PhD thesis)

3927. HOCKING, W. M., "Project Vanguard Report No. 32, Minitrack Report No. 5, Minitrack Data for the Artificial Earth Satellites 1958 Alpha and 1958 Beta from 7 May 1958 to 20 May 1958," NRL Report 5198. See also Department of Commerce PB146092; September 1958. ABSTRACT: The information necessary to permit satellite orbit computations from raw Minitrack data is given, and the Minitrack data on the satellites 1958 Alpha and 1958 Beta for the period 7 through 20 May 1958 are presented in appendixes. It is intended that the use of these data will encourage and facilitate the development of new computation techniques. The basic Minitrack measurement and the data message itself are described, and a discussion is made of the handling and preparation of the data message for the Vanguard IBM 704 computer. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3928. IGNATOV, V. S., "Reading Errors of a Differential Phase Shifter," Radiotekhnika, vol. 13, no. 9, pp. 58-63; 1958. ABSTRACT: A differential phase-shifter for the phase control of radio beacons is described. It consists of a goniometer, a 90° phase transformer and a capacitive bridge. Errors in reading are chiefly attributed to: (a) irregularities of the magnetic field inside the goniometer; (b) difference of potentials across the bridge; and (c) incorrect disposition of the stators of the goniometer with respect to each other. The magnitude of the errors, their measurement and possible ways of mutual compensation are outlined. (a-3, b-2, c-2, d-2, e-0, f-Description of equipment)

3929. ZIEHM, G., "Balanced Phase Capacitive Goniometer," Frequenz, vol. 12, no. 9, pp. 293-299; September 1958. ABSTRACT: After a brief description of two main groups of capacitive goniometers for vhf and uhf direction finders (electric field vector parallel to rotor axis or perpendicular to same), the need for phase balance and for the sinusoidal relationship between the rotor-stator capacitance and the rotating angle is explained and discussed. A Fourier analysis of this relationship is presented, and several practical arrangements of rotor element connections are considered. Tables are reproduced for rapid computation of the degree of phase balance for varying numbers of rotor elements and the desired max. order of harmonics. Further improvement is possible by the use of a second rotor which is displaced by an angle ϵ, and formulae are derived expressing the area of the displaced rotor in terms of ϵ and characteristic dimensions of the single rotor and stator elements. An alternative method of approximating the optimal shape by a synthesis of a number of narrow rectangular elements is presented and shown also to be applicable to inductive goniometers. (a-3, b-2, c-4, d-4, e-0, f-Description)

3930. ANONYMOUS, "Research on Antennas for Aircraft and Missiles," Antenna Laboratory, Ohio State University Research Foundation, Columbus, Ohio, Interim Report, Contract No. AF 33(616)-03353, ASTIA No. AD-301 922; 1 September 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3931. TRAVERS, D N., MOORE, J. D., LINCOLN, J. P., DUBOIS, V. G., AND DONALDSON, W. L., "A Spinning Multiloop Direction Finder for the Reduction of Shipboard Reradiation Error," Southwest Research Institute, Task Summary Report IV, Contract NObsr-64585; 1 September 1958. ABSTRACT: Shipboard high frequency radio direction finding with existing simple loop equipment is difficult because unobstructed antenna sites are generally unavailable or not utilized. Site modification is seldom feasible and improvement of performance must be accomplished by antenna types which are less affected by reradiated field components than are antenna types now in use. Design criteria for a direction finder antenna which is relatively insensitive to reradiation has been sought first analytically by determination of the theoretical properties of a certain multiloop array, and second by experimental verification with laboratory models of what appears to be the most promising system. Parameters which control reradiation error have been determined and conditions which must be fulfilled in order to reduce the error to a specified level are stated. A design which is believed to be sufficiently practical for shipboard use is described which has reduced the reradiation error of a simple loop by a factor of three, under test conditions simulating a reradiated field. The details of this design are presented with a review of practical problems related to causes of pattern distortion and siting requirements. (a-1, b-3, c-1, d-1, e-72 and 1000, f-Summary report)

3932. VANTINE, H., JR., AND JOHNSON, E. C., "Modified Transceivers Compute Distance," Electronics, vol. 31, pp. 94-98; 12 September 1958. ABSTRACT: Two communications transceivers operating on a common frequency form an interrogator-responder system between an aircraft and the ground. The time delay between the transmitted and received pulses allows distances to be measured to within ±0.1 mile. Circuit details are given. (a-3, b-2, c-1, d-1, e-0, f-Description)

3933. BEDNASH, C. S., AND CLIFFORD, V. F., "Direction Finder Group, UHF," ITT Laboratories, Nutley, New Jersey, Quarterly

Report No. 5, Contract No. DA 36-039-sc-74839, ASTIA No. AD-208 690, 30 September 1958. ABSTRACT: The field tests have been completed in the engineering model of the GRA-38 equipment and shipment to the Government is expected shortly. Included with this report are test results and preliminary schematics. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3900)

3934. BAILEY, D. K., "The Effect of Echo on the Operation of High Frequency Communication Circuits," IRE Trans., vol. AP-6, no. 4, pp. 325-329; October 1958. ABSTRACT: Echo on high-frequency communication services is defined as the simultaneous reception of signals over both major and minor arcs of the great circle connecting a transmitter and receiver. Two distinct kinds of echo are recognized according to the illumination conditions under which they occur. Echo of the first kind is observed when the great-circle path coincides with the twilight zone surrounding the earth, reas echo of the second kind, which can occur only on fairly long communication paths, is most severe when the short path is most intensely illuminated. Little can be done to obviate echo of the first kind and it is not, like echo of the second kind, amenable to prediction by available methods of calculating sky-wave field intensities. Radio traffic data are cited which corroborate calculations and show both that echo of the second kind is more severe at times of maximum solar activity, and is less severe on higher frequencies. Conclusions are drawn concerning mode of operation and choice of operating frequency to mininize echo interference. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

3935. CATH, P. G., "Correlation between Noise Voltages in Antenna Systems," Michigan University Research Institute, Ann Arbor, Michigan, Technical Report No. 88 on Contract DA 36-039-sc-63203, ASTIA No. AD-207 744. See also Department of Commerce PB146253; October 1958. ABSTRACT: To calculate the signal-to-noise ratio of the signal resulting when a number of antenna voltages are combined, it is necessary to know the degree of correlation between the individual noise components. In this report mathematical expressions are derived for the correlation between two noise voltages, induced in two antennas placed a known distance apart, assuming that the intensity of the noise arriving from each direction is known. The correlation coefficient is also derived for the noise voltages generated in two channels of a direction finder. The results are applied, as an example, to the case of a two-element rotatable Adcock antenna. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

3936. GILES, K. C., AND PETERSON, R. E., "Accuracy of RDF Position Fixes in Tracking Constant Level Balloons," Air Force Cambridge Research Center, Bedford, Massachusetts. See Department of Commerce PB137793, ASTIA No. AD-160 753; October 1958. ABSTRACT: Based on series of constant-pressure balloon flights that included concurrent tracking by standard radio direction-finding techniques and by camera techniques (which provided an accurate standard of true position), it has been possible to determine the distribution of errors in a significant sample of RDF fixes as made by networks manned by two different agencies. The comprehensive study of RDF fix error which is presented provides a sound basis for the use of such data. (a-1, b-3, c-1, d-1, e-0, f-Experiment)

3937. GRONEMEIER, H., "Transistorized Radio Direction Finder," Semi-Conductor Products, vol. 1, no. 5, pp. 36-40; September-October 1958. ABSTRACT: Because of its specialized marine application, design of transistorized radio direction finder involves electrical specifications and other requirements not encountered in conventional portables; problems and solutions relating to band coverage, power output, selectivity, sensitivity, direction finding, null meter, and heat are discussed with emphasis on unusual circuitry. (a-3, b-2, c-1, d-1, e-0, f-Description)

3938. HARE, E. W., "The Evaluation and Use of the Dectra Navigational System," J. Inst. Nav., vol. 11, pp. 377-384; October 1958. ABSTRACT: An interim report is given of field trials held by the British government since May, 1957. The system appears to be capable of providing highly accurate position information over the North Atlantic Ocean. (a-5, b-1, c-1, d-5, e-0, f-Test report)

3939. KEELING, H., "Air Trials of the Decca Navigator System," J. Inst. Nav., vol. 11, pp. 385-395. October 1958. ABSTRACT: A report is given of trials held in 1957 and 1958 to determine the operational suitability of the Mark 10 receiver and to compare its performance with that of the Mark 7. (a-5, b-1, c-1, d-5, e-0, f-Test report)

3940. KILIN, F. M., "Transient and Steady-State Processes in Automatic Range Scope - Part I," Automation and Remote Control, vol. 19, no. 10, pp. 881-896; October 1958. ABSTRACT: Description of operation of device and use of step function for analysis of processes in range scope; analysis takes into account such peculiarities of operation of device, discontinuous processes in some range scope parts and variability of circuit parameters that change in accordance with received pulses. (a-3, b-2, c-1, d-2, e-0, f-Description)

3941. MCLEISH, C. W., "Recording Techniques for H.F. Direction Finding, Electronic Radio Eng., vol. 35, pp. 386-390; October 1958. ABSTRACT NO. 1: Methods are described for reducing the information given by D/F equipment to a form which can be easily assimilated. The alternatives discussed are pen-recording of bearing-time and the photographic reproduction of the bearing/amplitude distribution functions. In both cases, records can be produced simultaneously from two direction finders, which facilitates comparisons. ABSTRACT NO. 2: The need for a means of recording direction-finding wave propagated by the ionosphere is discussed. Graphical recording systems are described which have been used on a twin-channel direction-finder for producing "bearing indication v. time" and "bearing indication v. signal-amplitude" records. (a_1-5, a_2-1, b-2, c-1, d-5, e-0, f-Description)

3942. MILES, M. W., "Radio Interferometers Track Airborne Vehicles," Electronic Ind., vol. 17, no. 10, pp. 94-95, 151-153; October 1958. ABSTRACT: An analysis of the problems encountered in tracking mobile sources of radio signals, and an interferometer method of gaining direction information as to orbit, trajectory or other flight path. (a-4, b-2, c-1, d-1, e-0, f-Analysis)

3943. SIMAS, V. R., AND KRONMILLER, G. C., "Project Vanguard Report No. 33. Minitrack Report No. 7, Calibrating the Mark II Minitrack System with Radio Stars as Signal Sources," NRL Report 5215. See also Department of Commerce PB151163; October 1958. ABSTRACT: The Mark II Minitrack System is described briefly and an operational analysis is made. A means of external calibration of the system by tracking radio stars is described and illustrated. Results obtained by this method are presented and compared with results obtained by the complex but more precise method used in calibrating Prime Minitrack stations. It is shown that the tracking of radio stars does in fact provide an adequate system calibration if sufficient data are taken. NRL R 52-15. For Minitrack report no. 1-5 see PB 131220, 131330, 131390, 131396, 131961. (a-3, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 3927)

3944. BENDER, R. M., BENNETT, P. E., ET AL., "Study and Investigation of Extremely High Altitude Ferret Reconnaissance Techniques," Haller, Raymond, and Brown, Incorporated, State College, Pennsylvania, Quarterly Report No. 3, Contract No. AF 33(616)5471, ASTIA No. AD-302 407; 10 October 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3945. ANONYMOUS, "Radio Aids to Navigation," Nature, vol. 182, pp. 978-980; 11 October 1958. ABSTRACT: Summaries of three papers read at the British Association meeting held in Glasgow, September 1958. (a-3, b-2, c-1, d-5, e-0, f-Abstracted summary of papers)

3946. BAILEY, A. D., AND SYDNOR, R. L., "An Investigation of Signal Amplitude to Bearing Deviation Correlation as a Function of Time in High Frequency Radio Direction Finding," Proc. NEC, vol. 14, pp. 1-14; 13-15 October 1958. ABSTRACT: The investigation is based on the application of a method described by Licklider and Dsendolet and extended by Sugar. Statistical scatter diagrams of the signal amplitude vs. bearing deviation of high frequency radio direction finder signals may be displayed on a cathode ray oscilloscope. Photographs of the display for selected intervals of display time permit an investigation of the correlation parameter as a function of display interval. The spinning goniometer radio direction finder lends itself particularly well to such studies of bearing deviation by means of simple adaptive circuits. A DAU type radio directionfinder was modified to obtain the necessary data for the correlation study. A comparison is made between the actual data and that of plausible idealized Rayleigh-Gaussian distributions. The results have application in the optimum use of small aperture radio direction finding systems. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

3947. TRAVERS, D. N., MOORE, J. D., ET AL., "Experiments on a Three Loop Antenna Electrostatic Screen, and Rotary Printed Circuit Transformer," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. 64585, ASTIA No. AD-214 123L;

26 October 1958. ABSTRACT: Previous reporting disclosed that vertical distortion of the three loop antenna pattern can be reduced by installing an isolated flat copper disc, under the radially distributed gap, so as to reduce the capacitance of the loops to external surroundings. An investigation of other performance characteristics affected by the presence of the disc has revealed that the only significant disadvantage is a reduction of the resonant frequency of the electrostatic screen. It has been determined that if the lowest resonance of the screen is kept above 40 megacycles this particular configuration can be used to advantage. The approximate design of the electrostatic screen to be used with the prototype version of the three loop antenna is described. Design requirements for a rotary printed circuit R.F. coupling transformer are reviewed with reference to the prototype three loop antenna. Extension of criteria, to 250 kc, previously used at 2 megacycles to determine the volume of the spaced loop, indicates that it is possible to utilize a single transformer for all simple loop performance from 250 kc to 32 mc. This makes possible a coupling transformer with only 2 channels rather than three as described in previous reports. An engineering model of a single channel rotary printed circuit transformer, essentially equivalent to one half the final 2 channel model has been constructed and bench tested. Tests indicate that very satisfactory results can be expected with respect to transfer characteristics and symmetry factor. Experiments performed in an effort to derive a simplified balancing procedure for the spaced loop crossover leads indicate that a resistance adjustment of each crossover point may be more significant in achieving balance than an inductance adjustment. This is being interpreted to mean that variations in lead length or tap position must be controlled. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

3948. GRIM, H. L., "Evaluation of Short Range Direction Finder Plotting Equipment Indicator Group AN/USA-3(XW-1)," Directorate of Flight and All-Weather Testing, Wright-Patterson Air Force Base, Ohio, ASTIA No. AD-209 436; 30 October 1958. ABSTRACT: This report describes the tests conducted, and results obtained, using a cathode ray tube indicator (AN/USA-3) to display automatic direction finder (D/F) bearings. The D/F information is remoted via microwave from a UHF D/F station located 19 miles from the indicator. With present D/F equipment the bearing of an aircraft from the station is displayed on an electro-mechanical pointer type indicator. This D/F information can be transmitted a maximum of five miles via telephone lines to a remote indicator. The AN/USA-3 D/F plotter displays direction finder bearings from as many as four separate D/F stations. If these stations are properly oriented and some means is provided to transmit the D/F information to the AN/USA-3 an instantaneous D/F triangulation fix will automatically be displayed on the AN/USA-3 cathode ray tube (CRT). The tests indicate satisfactory results in utilizing microwave to remote D/F information and in presentation of the D/F bearing on a CRT indicator. A total of 221 bearings have been recorded with an average error of ±5.3° as plotted against the AN/FPS-3 radar set. However, tests were made utilizing only one D/F station. Further tests with three D/F station inputs were discontinued because the UHF D/F equipment (AN/CRD-6) is not accurate enough for use in multi-station D/F fix presentation. Present plans are to conduct further tests with the AN/GRD-11 UHF D/F equipment when it becomes available. This equipment is designed for ±2° operational accuracy. (a-1, b-3, c-1, d-1, e-0, f-Description of evaluation test)

3949. ANONYMOUS, "Countermeasures Direction-Finding Antenna," General Electronic Laboratories, Incorporated, Cambridge, Massachusetts, Interim Report No. 3, Contract No. 72753, ASTIA No. AD-306 755L; 31 October 1953. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3950. GOLDSTEIN, M., "Antenna Control Group OA-( )/TRD," Belock Instrument Corporation, College Point, New York, Quarterly Report No. 1, Contract No. DA 36-039-sc-78110, ASTIA No. AD-212 111; 31 October 1958. ABSTRACT: Efforts were made to design, develop and manufacture a readily transportable, remotely operated servo controlled antenna drive pedestal and servo drive control unit with memory type CRT Indicator. This equipment shall provide the means for mounting, continuously rotating and accurately positioning in azimuth the direction finding antenna assemblies of direction finder group OA-1034 (XE-1)/TRD and modification kit, electronic equipment MK-383 ( )/TRD. The memory type CRT Indicator will provide visual indication of azimuth bearings of intercepted signals. See also AD-216 042. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

3951. SCHULL, G. R., AND ODIN, V. W., "Development of a Dead Reckoning Navigator (Automatic Radio Corrected)," Lear, Incorporated Santa Monica, California, Final Report, Contract No. DA 36-039-sc-72798, ASTIA No. AD-214 659; 31 October 1958. ABSTRACT: The developmental activities culminate in the fabrication of a flyable prototype automatically radio corrected Dead Reckoning Navigator, which has been installed in a Lear-owned Aero Commander, where at the moment of publication it is undergoing preliminary flight testing which already indicates satisfactory performance. Equipment developed and fabricated by this project consists of a system comprised of a Pilot's Indicator, and Input Unit, and a Computer Unit. These components, when used in conjunction with an aircraft's ADF systems, Gyro Compass and TAS system, automatically compute and display statistically-corrected navigational information to the pilot in the form of digital read-outs and pointer information on a compass card giving track angle heading and bearing to destination. Wind data can be set in manually to shorten the time for radio correction of wind drift. Digital read-outs, in units of nautical miles, are provided for range to destination and for the grid coordinates of present position. Alternate destination coordinates can be set in manually, and various destinations can be selected by switching. (a-1, b-3, c-1, d-1, e-0, f-Survey of project)

3952. BARTHEL, D. H., BATES, J. K., ET AL., "Airborne Electronic (Ferret) Reconnaissance Techniques," ITT Laboratories, Nutley, New Jersey, Interim Report, Contract No. AF 33(600)27521, ASTIA No. AD-303 891; November 1958. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3953. HAGFORS, T., AND LANDMARK, B., "Simultaneous Variation of Amplitude and Phase of Gaussian Noise, with Applications to Ionospheric Forward-Scatter Signals," Proc. IEE, Paper 2743R, vol. 105B, pp. 555-558; November 1958. ABSTRACT: The conditional probability density $p(\phi/A)$ is obtained for Gaussian noise, where $\phi = \Psi_2 - \Psi_1$ is the difference in phase as observed at the two times t and $t + \tau$ and A the envelope at either t or $t + \tau$. The mean of $|\phi|$ subject to the condition of a particular value of A is evaluated using numerical methods, and the variation of $|\phi|$ A with A is discussed. A simple relation is obtained for the limiting case when $\tau \to 0$. The noise character of the signal in an ionospheric scatter circuit has been tested. It is concluded that the simultaneous variations of signal amplitude and phase are in good agreement with those to be expected for Gaussian noise, and also that the assumption of a randomly phased angular spectrum appears to be justified. (a-3, b-1, c-1, d-5, e-0, f-Theory)

3954. TRAVERS, D. N., "Re-entrant Transmission Line Networks," Electrical Design News, November 1958. ABSTRACT: Re-entrant transmission line networks are formed by using two or more sections of transmission line of different lengths connected in parallel, in series, or in combination at their end points. There are four types of re-entrant networks that can be used to match any reasonable impedance to a line. With the accompanying table and a Smith chart, line sections having the same characteristic impedance may be used to construct such a network. If, the re-entrant network is placed at the load, the impedance to be matched must meet certain criteria. However, by transforming the load with a cascade section of line, the criteria can always be met. The method of analysis should be suitable for Beverage antennas in parallel and having different propagation constants. The original published text contains a minus sign omission in row 1 column 3 of the formula chart: Replace $Z_0R_L(R_L^2 + X_L^2)$ by $Z_0R_L - (R_L^2 + X_L^2)$. (a-1, b-2, c-1, d-1, e-0, f-Description)

3955. SPETH, A. J., "Improved Airborne Direction Finder," New York University College of Engineering, New York, Quarterly Report No. 2, Contract No. DA 36-039-sc-75074, ASTIA No. AD-211 001; 7 November 1958. ABSTRACT: The purpose of this program is the development of an automatic airborne direction finder which employs identifying amplitude modulation to establish the loop antenna null position. This report is primarily concerned with experimental evaluation of the various components which will be utilized for the detection of the loop antenna control signal from the identifying modulation. Tests on the voltage controlled oscillators show that all of the units constructed to date have the necessary frequency range and are reasonably stable with regard to power supply variations. However, loop tests indicate that higher oscillator sensitivity is required in order to minimize phase errors in the locking range. The test results on the automatic phase control loop show that it is possible to generate a local oscillator reference signal in the presence of interfering signals. Further loop evaluation is required to determine the necessary extent of interference rejection. (a-3, b-3, c-1, d-1, e-0, f-Progress report)

3956. KING, R. W. P., HARRISON, C. W., AND DENTON, D. H., "Transmission-Line Missile Antennas," Sandia Corporation, Report No. SCTM436-58(14); 20 November 1958. ABSTRACT: A class of protruding rocket antennas of low silhouette is analyzed. The approx-

imate equivalent circuit of these structures is a shunt-driven transmission line terminated in reactors of arbitrary value at each end. Expressions derived for the currents in the circuit, as functions of the reactive terminations, are employed in calculating the radiation vectors of the antenna. The radiation resistance is obtained by integrating the Poynting vector over the surface of a great sphere enclosing the structure. The driving-point reactance of the antenna is determined from transmission-line formulas, which may be modified appropriately to include terminal zone effects. (a-1, b-3, c-1, d-1, e-402, f-Analysis)

3957. ANONYMOUS, "Receiving Set, Radio, AN/URR-40 (XA-1)," Interim Reports Nos. 1-3, Contract No. AF 33(600)31312, ASTIA Nos. AD-215 325, AD-215 326, AD-215 327, AD-215 328, AD-215 329; 7 February 1956 to 30 November 1958. ABSTRACT: Report No. 1: The AN/URR-40(XA-1) program is concerned with the development and fabrication of 4 preliminary development models of a miniature, hand-carried direction-finder set for general Air Force use. Development work covered component investigation, procurement, and development; HF operation study; circuit design; and a preliminary packaging study. Suitable components were procured for almost every type of circuit equipment. Circuit design and packaging progressed satisfactorily. The development work described herein covers: continued component procurement and/or development; fabrication of actual-size, working-model, printed circuit IF-AF strip; packaging for receiver proper; loopstick antenna. The over-all developments' program is estimated to be approximately 50% complete at this time, although portions of the program are as much as 80% complete (such as component procurement and/or development; Report No. 2: Investigation of frequency vs temperature characteristics; completion of circuit design; receiver packaging; loop antenna; test procedures. Procurement and development of components and detailed circuitry is complete except for minor details. It is suggested that the first four developmental models be completed within the scope of the specifications, as modified to date, and incorporate whatever further changes become necessary after tests have been completed on the first four models; Report No. 3: The major portion of the breadboard work and mechanical design work was completed. Final engineering models are being constructed preparatory to final testing. Drawings are near completion, and except for antenna design, are approximately 90% completed. The major remaining circuit problem is the antenna. The performance of both the breadboard circuit and a preliminary ferrite antenna was very encouraging, demonstrating performance well in excess of that required by the specifications. The circuitry was firmed, and is shown. It was found that due to the increased available gain in the RF and IF stages, circuit gain was such that the first audio amplifier stage was superfluous. It was removed, and this has permitted great simplification of the mechanical design without degradation of performance. (a-1 and 3, b-3, c-1, d-1, e-0, f-Progress reports)

3958. ANONYMOUS, "'No Hands' Blind Landing," Wireless World, vol. 64, p. 579; December 1958. ABSTRACT: An automatic landing device, suitable for aircraft within 300 ft of the ground is described. Rate of fall is controlled by a radio altimeter. Centerline guidance is provided by a system using the magnetic fields generated by two cables running parallel to the runway. (a-3, b-2, c-1, d-5, e-0, f-Description)

3959. ANCKER, C. J., JR., "Airborne Direction Finding - Theory of Navigation Errors," IRE Trans., vol. ANE-5, no. 4, pp. 199-210; December 1958. ABSTRACT: Situation where n stationary, accurately located, direction finding stations fix position of unknown emitter by intersecting angular bearings, has been previously investigated; for case where angular bearings have small, normally distributed errors, this solution is extended to include case of airborne direction finding, which introduces uncertainties in locations of direction finding stations arising from navigation errors; various navigation procedures compared. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3960. BOHNENSTENGEL, H., KRONJAEGER, W., AND VOGT, K., "Horizontal Directional Patterns of Rhombic Receiving Aerials for Short Wave Transmission Routes," Nachrichtentech. Z., vol. 11, no. 12, pp. 605-610; December 1958. ABSTRACT: Statistical measuring techniques were evolved for pattern measurements. The possible deviations between the theoretical radiation pattern, or one measured at a smaller distance from the aerial, and values obtained in practical communication are shown to be entirely general through azimuthal and vertical fluctuations of the angle of the incident wave. Values of azimuthal fluctuations in 98% of observed cases amount to 2° to 5°. Measurements were made at 10, 15, and 20 Mc/s. The value of the back lobe is around 20 dB and that of the side lobes 6 to 8 dB. The investigations of the vertical angle show that at distances of about 2000 km angles of incidence of 10° to 20° occur, whereas over sea routes this angle is about 10°. (a-2, b-2, c-4, d-4, e-0, f-Investigation)

3961. COTTONY, H. V., "Techniques for Accurate Measurement of Antenna Gain," National Bureau of Standards, Circular No. 598; December 1958. ABSTRACT: Comparison of published results of experimental antenna measurements, particularly gains, reveals apparent discrepancies of the order of one or more decibels. Experimental work at the National Bureau of Standards on scaled model antennas for long-range VHF communication via ionospheric scatter revealed some sources of difficulties and led to the adoption of special precautions resulting in significantly more consistent and, it is believed, more accurate results. The procedures are based on the comparison method, but include, in addition to the standard antenna, the use of a third antenna here designated as the reference antenna. To obtain more accurate measurements it was found essential to correct for the standing wave pattern in the field set up, presumably, by reflections from the irregularities in the terrain. Special features of instrumentation, including methods for minimizing and measuring matching losses, are described. The accuracy of the techniques has been verified by measuring the gain of an antenna, the value of which could be accurately calculated. (a-1, b-3, c-1, d-1, e-62, f-Analysis)

3962. ENOMOTO, H., "A New Theory of Scatter Propagation," J. Inst. Elec. Commun., Japan, vol. 41, no. 12, pp. 1233-1242; December 1958. ABSTRACT: The theory assumes that multiple scattering is a phenomenon of multiple partial refraction caused by atmospheric turbulence. A comprehensive statistical study of the characteristics of this mode of propagation is presented. It is noted that Chisholm's experimental results regarding the differential delay time are not well explained by the primary-scatter theory, but are well explained by the multiple-scatter theory. The frequency dependence of scatter loss is discussed by means of an integral resembling Fresnel's integral. When the phase variation is large, the theory shows scatter loss to be independent of the wavelength λ, but in other cases scatter loss is inversely proportional to λ. (a-3, b-1, c-6, d-6, e-0, f-Theory)

3963. FRIED, W. R., "Performance Profiles and Future Outlook of Doppler Navigation Systems," IRE Trans., vol. ANE-5, no. 4, pp. 194-199; December 1958. ABSTRACT: A method of determining position error of Doppler navigation systems is discussed which is based on the component errors and on statistical considerations. Sample calculations for four typical systems are presented. The historical behavourial performance of the three major components of a Doppler navigation system, the velocity sensor, the computer and the heading reference are analysed and presented graphically. The weight trends of the components of Doppler navigation systems and of the complete systems are described. Possibilities of certain combinations of self-contained and ground-referenced navigation systems are discussed. (a-2, b-1, c-1, d-1, e-0, f-Discussion and analysis)

3964. GARRIOTT, O. K., AND VILLARD, O. G., "Antipodal Reception of Sputnik III," Proc. IRE, vol. 46, p. 1250; December 1958. ABSTRACT: The reception of radio signals from an orbiting earth Satellite near the antipodes has been reported by Wells. His observations have indicated that "in all respects, the image signals appeared to originate in a point source similar to the actual satellite." The 20-mc radio transmissions from Sputnik III have been monitored by members of the Stanford University Radio Propagation Laboratory in an attempt to confirm this phenomenon. The signals were received on a standard communications receiver connected either to a fixed "turnstile" antenna 3/8 λ above the ground, or to a three-element horizontal Yagi 5/8 λ above the ground. The Yagi antenna can be rotated to determine the approximate direction of arrival of the signals. During most of the period means were available to determine the absolute frequency of the signals, and when they were sufficiently strong to record them on magnetic tape. (a-1, b-1, c-1, d-1, e-0, f-Description of observation)

3965. RICHTER, F. G., "Direction Finder Set AN/TRD-15(XE-2)," Servo Corporation of America, New Hyde Park, New York, Quarterly Report No. 4, Contract No. DA 36-039-sc-72809, ASTIA No. AD-210 586; 18 December 1958. ABSTRACT: The development of the AN/TRD-15(XE-2) to provide for dual-channel operation from a single antenna array with no loss of sensitivity has been successfully demonstrated. Extension of the design to 3 or 4 more outputs appears completely feasible in the present state of the art. (a-3, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3745)

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3966. ANDERSON, R. E., AND FRENCH, A. D., "Tracking Pioneer IV beyond the Moon," IRE Nat. Convention Record, vol. 7, Part 5, pp. 152-157; 1959. ABSTRACT: A receiving station set up in order to track Pioneer IV is described. The receiver is of special high stability using a phase-locked local oscillator to derive a 1st IF of 30 Mc/s, which is later converted to 455 kc/s, at which frequency the signal is compared with inphase and phase-quadrature outputs of a stable oscillator in order to provide demodulation and received signal amplitude. An estimate of the range performance of the system agrees well with that observed. The angular position of the transmitter could be determined to ± 1° by a directive aerial on a naval gun mounting. (a-3, b-1, c-1, d-1, e-0, f-Description)

3967. BARBER, N. F., AND CROMBIE, D. D., "VLF Reflections from the Ionosphere in the Presence of a Transverse Magnetic Field," J. atmos. terrest. Phys., vol. 16, pp. 37-45; 1959. ABSTRACT: The reflection coefficient is found for waves that are incident on a sharply bounded ionosphere and have their electric vector in the plane of incidence. The earth's magnetic field is assumed to be horizontal and perpendicular to the direction of propagation. Hence the analysis is appropriate for propagation round the magnetic equator. It is found that the reflection coefficient for waves incident from the west is numerically greater than that for waves incident from the east, when the angle of incidence is large. (a-3, b-1, c-1, d-5, e-0, f-Theory)

3968. BELOOUSOV, S. P., AND YIAMPOLSKI, V. G., "On the Determination of the Propagation Constant of a Wave in a Long Conductor," Radiotekhnika, vol. 14, no. 7, pp. 3-7; 1959. ABSTRACT: An approximate method of calculating the phase velocity and attenuation of a wave being propagated along a long conductor suspended above the ground. (a-1, b-2, c-2, d 2, e-876, f-Propagation theory)

3969. CROWDER, H. A., "Ground Clutter Isodops for Coherent Bistatic Radar," IRE Nat. Convention Record, vol. 7, Part 5, pp. 88-94; 1959. ABSTRACT: Isodops are lines of constant Doppler shift on the earth's surface relative to a moving receiver and/or transmitter. Such contours define a region which represents the effective radar cross-section of the earth for coherent Doppler radar. While the active case, in which the transmitter and receiver have a common location and velocity, is well known, the bistatic or semi-active case in which the two velocities and/or locations differ is more involved. A general equation is formulated for the semi-active isodops, from which the active clutter isodops are shown to fall out as a special case. Use of the isodops to determine signal-to-clutter ratios in the radar receiver is demonstrated. A numerical method of computing both the isodops and signal-to-clutter ratio is described. Some illustrative semi-active isodops are presented. (a-3, b-1, c-1, d-1, e-0, f-Theory)

3970. DEFEITER, L. D., "Design and Results of the Observation Programme of the Ionospheric Research and Radio-Astronomy Department of the Netherlands P. T. T.," Tijdschr. Ned. Radiogenoot., vol. 24, no. 4, pp. 189-198; 1959. ABSTRACT: Discusses radio observations of the sun during recent years of max. solar activity. The sun is kept under continuous observation at 200 and 545 Mc/s by radio telescopes at the Nera observatory in Holland and by stations in Dutch Guiana and New Guinea. Type IV solar radio bursts are important in forecasting geomagnetic storms. From interferometry measurements described, diameters of sources of enhanced emission and brightness distributions over the source can be determined. (a-3, b-1, c-12, d-12, e-0, f-Observation report)

3971. DESIZE, L. K., AND WOODWARD, B. A., "An Investigation of the Feasibility of Obtaining a Constant Beamwidth Luneberg Lens," Proc. Nat. Electronics Conf., vol. 15, pp. 958-964; 1959. ABSTRACT: An investigation was conducted to determine the feasibility of obtaining a constant-beam width Luneberg lens for direction-finding applications. A modified Luneberg lens was derived that produces spherical phase fronts. These phase fronts, in conjunction with a controlled amplitude distribution in the lens aperture, give radiation patterns having a half-power beam width variation of less than ±10% of the design beamwidth over a 3:1 frequency band. An experimental two-dimensional model of a modified Luneberg lens was built, and the theoretical phase front verified by measurement of the phase front across the lens aperture. (a-3, b-1, c-1, d-1, e-0, f-Study and experiment)

3972. DOENITZ, AD. K., Memoirs - Ten Years and Twenty Days, The World Publishing Company, New York; 1959. ABSTRACT: A review of German U-Boat activity during World War II. Some of the countermeasures described and attributed to the British were not as described in the book but were in fact D/F equipments. (a-5, b-6, c-1, d-1, e-721, f-Historical interest)

3973. ELLIS, R. E., AND ROHLMAN, W. C., "Ampliture-Modulated Video Integrator," IRE Nat. Conv. Record, vol. 7, Part 5, pp. 263-271; 1959. ABSTRACT: An ultrasonic quartz delay line is used, as the basic storage medium, for the cumulative summation of radar video signals, within any possible range quantum. Pulses received, at the same range, from any one target are integrated by linear addition of amplitudes whereas the addition of noise signals is rms wise: a s/n improvement therefore results. The radar trigger is derived by recirculation of a pulse in the same quartz line, on a different carrier channel, to ensure time correspondence of incoming with delayed signals. System operation, block schematic and circuit diagrams are given. Systematic trials have shown a 3 dB improvement in detection range for 50% probability of paint; the better contrast obtained on previously just-detectable signals gives a significant improvement in the performance of the human operator in the role of detector. Furthermore, the effect of non-locked interference pulses is drastically reduced, to the order of system noise level, by signal limiting, before summation, and non-integration due to the absence of range correlation; this effect is demonstrated with photographs. (a-3, b-1, c-1, d-1, e-0, f-Description)

3974. FEDERICI, M., "The Accuracy of Measuring the Direction of a Sound Source by a Directional Receiver System," La Ricerca Scientifica, vol. 29, no. 11, pp. 2301-2313; 1959. ABSTRACT: The author examines the directional accuracy of the various systems by which the directions of radiating sound or radio wave generators are determined. He considers four different methods of detecting minimums, including a correlation system as well as one for determining the coincidences of zeros. According to his findings, the direction finding accuracy does not depend on the circuit applied but solely on the signal-to-noise ratio and on the directional characteristics of the receiver system. (a-1, b-1, c-9, d-9, e-0, f-Comparison and evaluation)

3975. FINK, C., "The Directional Coupler Antenna," IRE Nat. Convention Record, vol. 7, Part 1, pp. 103-118; 1959. ABSTRACT: The combination of four broadband 3 dB directional couplers and four radiating elements into an aerial for D/F purposes was investigated. Under theoretical conditions, two overlapping beams with constant crossover level and variable crossover slope over an infinite frequency band can be obtained. All four radiators are active in producing each of the two main lobes for simultaneous comparison, thereby providing the pattern effect of two aerials of similar dimensions. Practically, a pattern with crossover level 3 to 5 dB below beam maximum, and pointing accuracy of ±0.75° over a 2.2 to 1 bandwidth was achieved (a-2, b-1, c-1, d-1, e-0, f-Study)

3976. FULLILOVE, N. H., SCOTT, W. G., AND TOMLINSON, J.R., "Hourglass Scanner New Rapid Scan, Large Aperture Antenna," IRE Nat. Convention Rec., vol. 7, Part 1, pp. 190-200; 1959. ABSTRACT: Wide aperture, rapid scan antenna, termed hourglass scanner, is described; wide aperture is provided by combining shaped reflector in vertical plane with circularly disposed feed array in horizontal plane; rapid scanning is achieved through rotation of small non-contracting rf commutator; unique feed array provides for four independent beams each covering adjacent 2 to 1 frequency bands. (a-3, b-1, c-1, d-1, e-0, f-Description)

3977. HARANG, L., AND TROIM, J., "Determination of the Direction of Arrival of Auroral Echoes," J. atmos. terrest. Phys., vol. 13, nos. 1-2, pp. 107-110; 1959. ABSTRACT: The angle of arrival, θ, of auroral echoes is measured by an interference method. The variation of θ with echo range R is demonstrated. θ varies from 15° to 6.5° when the range increases from 400 to 730 km. The height of the reflection area must lie at 100-120 km. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

3978. HOWARD, D. D., "Radar Target Angular Scintillation in Tracking and Guidance Systems Based on Echo Signal Phase Front-Distortion," Proc. Nat. Electronics Conf., vol. 15, pp. 840-849; 1959. ABSTRACT: The slope of the phase front of the echo signal from a finite size complex target is shown to be identical to the angular errors caused in tracking radars by angular scintillation of target angle noise. Since angle tracking systems are essentially phase front measuring devices, it is demonstrated that the target angle noise is contained in the echo signal as a distortion of its phase

front. This new concept aids in visualising the source of target angle noise and in assessing the effects of target angular scintillation or target angle noise on any target locating device. As an example, it is shown that identical target angle noise errors also occur in search radar. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

3979. KARPLES, M., AND PARKER, E. G., "An Improved Instrument Low Approach System Compatible with TACAN," IRE Nat. Conv. Record, vol. 7, Part 5, pp. 43-53; 1959. ABSTRACT: The complete TACAN I. L. S. system as well as the theory of a variable phase slope aerial are described. The principal advantages of this system are described as accurate definition of the space coordinates of the approach funnel allowing the selection, in the aircraft, of an optimal approach path; better utilisation of aerial aperture; the TACAN ground equipment is lighter and more mobile; airborne equipment requires a minimum of added weight and volume while permitting the elimination of three separate receivers. (a-3, b-1, c-1, d-1, e-0, f-Description)

3980. LEMUNYAN, C. D., WHITE, W., NYBERG, E., AND CHRISTIAN, J. J., "Design of a Miniature Radio Transmitter for Use in Animal Study," J. Wildlife Mgmt., vol. 23, no. 1, pp. 107-110; 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

3981. MAEDA, K., KATO, S., AND TSUDA, T., "A Theory of Ionospheric Radio Wave Scattering under the Influences of Ion Production and Recombination," J. Geom-Geoel., vol. 10, no. 3, pp. 91-98; 1959. ABSTRACT: For the daytime E-layer ionospheric scatter propagation, the controlling solar influences cannot be neglected. To account for the experimental results obtained by Bailey et al. (1955), showing solar influences, a new theory is proposed which introduces the effects of ion production and recombination to Villars-Weisskopf's pressure theory. The electrons are assumed to be compressed or dilated at the same rate as the air itself, the latter being subject to adiabatic change of pressure, while the electrons and ions moving with the air molecules are produced by solar radiation and then recombined. The results obtained are quite satisfactory to account for the dependence of received scattered signal intensity on both frequency and scattering angle, at least concerning the daytime solar controlled scatter propagation in the E-region. (a-3, b-1, c-6, d-6, e-0, f-Theory)

3982. MCCANN, E., AND HIBBS, H. H., "Electrically Small D. F. Antenna," IRE Nat. Convention Record, vol. 7, Part 1, pp. 64-73; 1959. ABSTRACT: A metal cylindrical shell about 0.15λ diam. and 0.35λ long carries two diametrically disposed slots inclined at 45° to the axis of the cylinder. These slots provide a figure of eight radiation pattern which can be used for direction finding with 180° ambiguity. This can be resolved by the use of one of the slots alone which give a cardioid radiation pattern. This system can be used for horizontally and vertically polarised signals over a frequency band of 2:1. The associated turning mechanism can be accommodated within the cylinder. (a-2, b-1, c-1, d-1, e-0, f-Description)

3983. SINCLAIR, D. A., Translation of "A New Method of Determining the Components of Radio Bearings from Coherent Waves," by H. Gabler and M. Wachtler, Elektrotech. Z. (ETZ), 79A (11), pp. 385-388; 1958. National Research Council of Canada Technical Translation 819, Ottawa, Canada; 1959. ABSTRACT: See Abstract No. 3 of No. 3894. (a-4, b-3, c-1, d-7, e-0, f-Translation)

3984. SMIT, J., AND WIJN, H. P. J., Ferrites, John Wiley & Sons, New York, N. Y.; 1959. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Reference book)

3985. ANONYMOUS, "Evaluation of Direction Finding Equipment AN/PRD-6," Army Electronic Proving Ground, Fort Huachuca, Arizona, Report No. USAEPG-SIG 930-83, ASTIA No. AD-217 934; January 1959. ABSTRACT: The performance of AN/PRD-6 direction finding equipment is to be evaluated for combat surveillance applications. Two models, the AN/PRD-6(XE-1) and (XE-2), will be tested. The basic components of each model are the R-744/PRD receiver, the PP-1481/PRD (vehicular) power supply, and the AN/PRA-3 loop antenna assembly with mast and base. The performance tests will include tests of receiver sensitivity and calibration, image rejection, D/F antenna tuning characteristics, and of cumulative azimuth error. Application tests include the vectoring of troops, determining location of enemy transmitters, and the support of other combat surveillance devices. (a-3, b-3, c-1, d-1, e-0, f-Evaluation report)

3986. ADCOCK, F., "Radio Direction Finding in Three Dimensions," Proc. IRE, Australia, vol. 20, no. 1, pp. 7-11; January 1959. ABSTRACT: Methods of determining the direction of propagation of radio signals, in three dimensions, using spaced aerial systems are discussed and a direct reading system is proposed. Errors caused by the proximity of the earth are indicated. (a-3, b-1, c-1, d-11, e-0, f-Discussion)

3987. ARONOV, I. A., AND NOVIK, G. KH., "Electronic Phasemeter with a Range -180° to +180°," Priborostroenie, no. 1, pp. 20-22; January 1959. Translation in Instrum. Constr. ABSTRACT: A device is described suitable for measuring the phase difference between two series of pulses (say A and B) of the same shape. The phase difference is measured by comparing the series of the sum of pulses A + B with the series of the difference of pulses A - B. The results of this comparison are smoothed and provide an average current whose magnitude and polarity give the phase difference between the two series. (a-3, b-2, c-2, d-2, e-0, f-Description)

3988. BAERNER, K., "Navigation Systems," Zeit fuer Flugwissenschaften, vol. 7, no. 1, pp. 1-13; January 1959. ABSTRACT: Principle of operation, range and accuracy of equipment considered; no attempt is made to evaluate either ground based or airborne equipment; reference made to Loran standard long range and Decca flight system and systems used for instrument and ground controlled approaches to airfields, under adverse flying conditions. (a-3, b-2, c-4, d-4, e-0, f-Navigation principles)

3989. BAKHAREVA, M. F., "The Correlation between Waves of Different Frequencies Travelling Through a Layer of Statistically Inhomogeneous Medium," Radiotekhnika i Elektronika, vol. 4, no. 1, pp. 141-155; January 1959. Translation in Radio Engineering and Electronics. ABSTRACT: The correlation coefficients at one point for the fluctuations of the amplitudes and phases of two waves of different frequencies after travelling through partially overlapping layers of a medium having large-scale random inhomogeneities of refractive index are obtained. The results are used to estimate the dimensions of E and F inhomogeneities and give values in agreement with experimental results. (a-3, b-2, c-2, d-2, e-0, f-Theoretical analysis)

3990. FAL'KOVICH, S. E., "The Potential Accuracy in Determining the Angular Coordinates in Radar Systems," Radiotekhnika i Elektronika, vol. 4, no. 1, pp. 142-144; January 1959. Translation in Radio Engineering and Electronics. ABSTRACT: It is proposed that reliable detection be effected of a reflected signal against a background of fluctuating noise. This task consists of the determination of the limiting accuracy as regards the reading of the angular co-ordinate θ use being made of the single-pulse method. The dispersion $\overline{(\theta_0^* - \theta_0)^2}$ of the value θ_0^*, in relation to the true magnitude of the co-ordinate θ_0^*, serves as a measure of accuracy. The most that can be done with a receiving apparatus, as regards the measuring of an angular co-ordinate, is to establish, in accordance with X(t), the oscillation received and in the capacity of output effect, the distribution of a posteriori probabilities, $Px(\theta)$, concerning the presence of a target at all angular co-ordinates θ within a certain area $(\theta_1; \theta_2)$. The a priori distribution of angular co-ordinates within this area is suggested as being proportionate, and the co-ordinate of distance as being fixed. There exists, theoretically, a limiting magnitude as regards the dispersion of values. The values, the dispersion of which tallies with this theoretically limiting magnitude, are known as effective. If an effective value exists it can always be obtained by the law of maximum probability. It is possible to show that a value in accordance with maximum probability is unmoved in its relation with the theoretically limiting dispersion, if the function of the a posteriori probability, $P_x(\theta)$ has a peak symmetrical in relation to the maximum, below which peak is concentrated the predominant part of the single mass. (a-1, b-2, c-2, d-2, d-0, f-Analysis)

3991. FERNANDES, C., "On Design of Some Rhombic Antenna Arrays," Trans. IRE, vol. AP-6, no. 1, pp. 39-46; January 1959. ABSTRACT: Expression of field radiated by rhombic antenna, taking into consideration both vertical and horizontal polarisation components, is used to establish theory of array of two stacked rhombics and of array of four rhombics in stacked and interlaced arrangement; there is greater concentration of power radiated along directions of main lobe of pattern and, as result, these arrays show appreciable gain over conventional rhombic; rules for design of arrays for point-to-point and broadcasting. (a-3, b-1, c-1, d-1, e-0, f-Rhombic antenna theory)

3992. JOHLER, J. R., AND WALTERS, L. C., "Propagation of a Ground Wave Pulse Around a Finitely Conducting Spherical Earth from

a Damped Sinusoidal Source Current," IRE Trans. on Antennas and Propagation, vol. AP-6, no. 1, pp. 1-10; January 1959. ABSTRACT: The form of the transient electromagnetic ground wave which has been propagated over a finitely conducting spherical earth from a source current dipole can be calculated by a direct quadrature evaluation of the Fourier integral. The method is illustrated by a calculation of the transient field radiated by the particular case of the damped sinusoidal source current dipole. At short distances from the source, the earth was assumed to be a plane and the displacement currents in the earth were neglected. The pulse was then calculated by a direct evaluation of the Fourier integral and the integration was verified by special operational methods (inverse Laplace transformation). The form of this pulse was then predicted at great distance from the source by a direct evaluation of the Fourier integral in which the displacement currents in the earth and the earth's curvature were introduced into the Fourier transform. The form of the transient signal was found to be dispersed by the propagation medium. The most noteworthy attribute of this dispersion is a stretching of the period of the wave so that the form of the source is somewhat obscured by the filtering action of the medium. (a-3, b-1, c-1, d-1, e-0, f-Propagation theory)

3993. KING, R., "Rectangular Loop Antenna as Dipole," Trans. IRE, vol. AP-6, no. 1, pp. 53-61; January 1959. ABSTRACT: Circuit properties of antenna are determined when loop is driven in transverse mode by equal and codirectional generators at centers of one pair of parallel sides; first order expressions for currents and identical input impedances at two driving points are given in form that involves only tabulated functions; new formula for impedance is consistent with previously available formulas for symmetrically driven folded dipole and for transmission line. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

3994. MCLEISH, C. W., AND ROGER, R. S., "An Investigation of High-Frequency Direction-Finding Errors Caused by Nearby Vertical Reradiators," Proc. IEE, vol. 106B, pp. 58-60; January 1959. ABSTRACT NO. 1: An expression for the maximum errors caused by reradiators is derived and the susceptibilities to error of three types of D/F aerial are compared. ABSTRACT NO. 2: The theory of reradiation from resonant conductors is reviewed, and the susceptibilities to error of three types of direction-finding aerial are compared. Measured errors due to reradiation confirm theoretical values derived from a simple expression in cases of thin linear conductors in simple resonant modes. (a_1-5, a_2-5, b-1, c-1, d-5, e-0, f-Study)

3995. SCHMITT, H. J., "Back-Scattering Measurements with a Space-Separation Method," Trans. IRE, vol. AP-6, no. 1, p. 15; January 1959. ABSTRACT: A method for the experimental determination of the back-scattering cross section of arbitrarily shaped obstacles is suggested, which, in a manner analogous to the Michelson interferometer in optics, makes use of a semitransparent mirror in order to separate the incident wave and the reflected wave. A measurement setup is described, and possible sources of error are discussed. The accuracy of measurements is investigated by comparing the measured values of the back-scattering cross section of circular metallic disks with the results obtained from the exact theory. (a-1, b-1, c-1, d-1, e-0, f-Description)

3996. BAGHDADY, E. J., AND RUBISSOW, G. J., "Dynamic Trap Captures Weak F-M Signals," Electronics, vol. 32, p. 64; 9 January 1959. ABSTRACT: Well-designed conventional f-m receivers process the sum of two cochannel signals in such a way as to suppress the effect of the weaker signal and deliver a substantially undistorted replica of the message carried by the stronger signal. This channel-capture effect is a well-known characteristic of wide-band f-m systems. It is a boon to high-fidelity transmission when there is some assurance that the desired signal is the stronger of the two competing signals. But in many important applications such an assurance cannot be made and the desired signal is likely to be the weaker of the two. In applications such as police, military and telemetering systems, the desired signal may be suppressed irretrievably by a stronger undesired signal. Systems that can capture the weaker of two cochannel f-m signals, when desired, not only facilitate reliable communication, but also hold promise for more efficient use of the spectrum. The system to be described in this article makes use of a trap that tracks and attenuates the stronger of two signals. Because this signal is frequency modulated, a knowledge of its frequency behavior is needed to guide the trap. This knowledge can be derived with a conventional f-m demodulator such as a limiter-discriminator from the sum of the two input signals. After appropriate filtering, the output voltage of the demodulator varies essentially with the frequency of the stronger of two input signals. If this voltage is impressed upon the control grid of a reactance-tube circuit that forms a part of a high-Q tuned trap, the tuning of the trap is varied so that its center frequency follows the instantaneous frequency of the stronger signal. In this way, the trap attenuates the undesired signal below the level of the desired but initially weaker signal. A second conventional f-m demodulator that follows the trap extracts the desired message. (a-1, b-2, c-1, d-1, e-0, f-Description)

3997. BENDER, R. M., BENNETT, P. E., ET AL., "Study and Investigation of Extremely High Altitude Ferret Reconnaissance Techniques," Haller, Raymond, and Brown, Incorporated, State College, Pennsylvania, Quarterly Report, Contract AF 33(616)5471, ASTIA No. AD-304 475; 10 January 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

3998. BLOHM, O., "The Invention of Infra-Red Telegraphy and Infra-Red Direction Finding," VDI-Z, vol. 101, no. 2, p. 62; 1959. ABSTRACT: During the first World War an infra-red filter was placed in front of the flash lamps of Morse blinkers and the receivers were fitted with a thermocouple, to prevent signals from being intercepted. Through suitable amplification the receivers became so sensitive that they responded to the heat of the human body when a person happened to be in the vicinity of the receiving mirror. This led to the development of the infra-red direction finder, which enabled ships to be identified at sea. (a-1, b-2, c-4, d-4, e-0, f-Historical survey)

3999. BROWN, D. M., AND WALTER, C. H., "Modified Surface Wave Luneberg Lens," Antenna Laboratories, Ohio State University Research Foundation, Columbus, Ohio, Report No. 667-47, Contract AF 33(616)3353, ASTIA No. AD-215 219; 15 January 1959. ABSTRACT: A Luneberg lens, modified such that the focus lies within the lens rather than on the circumference is described. The lens is utilized as a flush-mounted surface-wave radiator and is excited from below by a tapered-depth waveguide feed whose phase velocity is matched to that of the lens at the point of focus. (a-1, b-3, c-1, d-1, e-0, f-Description)

4000. TRAVERS, D. N., MOORE, J. D., ET AL., "Progress on the Design and Construction of a Three Loop Prototype Antenna for Use with an AN/SRD-7 Receiver," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. 64585, ASTIA No. AD-214 124L; 26 January 1959. ABSTRACT: This report summarizes the engineering work performed during the past three months toward the construction of a prototype three loop antenna system for use with an AN/SRD-7 receiver. The events leading up to the specification of a two channel rotary printed circuit coupling transformer for the antenna are summarized and the design details briefly described. Design details for the electrostatic screen have been specified completely. Drawings have been prepared and bids accumulated for the fabrication of this screen. The rotating antenna assembly has been designed and detailed drawings have been submitted to interested manufacturers who are capable of constructing these items from cellular fiberglass materials. Work which was performed toward the investigation of an adjustable cross-over is reviewed. It has been decided to construct the crossover in a manner similar to that which was used in the breadboard models. The reasons for this method of construction are reviewed. Redesign of the antenna tuning turret and amplifiers has been completed and the details are reviewed. Following recent discussions, it was decided that if possible, the automatic calibrator equipment in some modified form would be used to evaluate the bearing error performance of the three loop antenna system when it is shipboard tested. The problems involved in converting the existing calibrator for use with this antenna are reviewed for three separate cases. These are: (1) The pure simple loop case, which requires the simplest modification. (2) The pure spaced loop case, which is probably a somewhat more difficult modification. (3) The general three loop case, where modification or redesign does not appear to be feasible within the time allotted before the calibration is to be performed. An alternate procedure for collecting data in the general three loop case is suggested and the reasons for not plotting a normal calibration curve in this instance are discussed. The work which was assigned concerning the evaluation of the AN/BRD-2 antenna is reviewed. (a-1, b-3, c-1, d-1, e-1000, f-Interim report)

4001. ANONYMOUS, "Countermeasures Direction-Finding Antenna," General Electronic Laboratories, Incorporated, Cambridge, Massachusetts, Interim Report No. 4, Contract No. 72753, ASTIA No. AD-306 555L; 31 January 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4002. GOLDSTEIN, M., "Antenna Control Group OA-( )/TRD," Belock Instrument Corporation, College Point, New York, Quarterly Report No. 2, Contract No. DA 36-039-sc-78110, ASTIA No. AD-216 042; 31 January 1959. ABSTRACT: The final design phase of the program was completed. The pedestal assembly design was completed

and components are in production. The position indicator console which consists of power supply, position indicator assembly and the electronic assembly is in the final design stage. The power supply and electronic assembly were released for manufacture. The M.G. set and the servo motor design parameters have been modified from a 4000 in./lb to a 2000 in./lb load. Contract modifications were undertaken accordingly. See also AD-212 111. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4003. APPLETON, E. V., "The Normal E Region of the Ionosphere," Proc. IRE, vol. 47, no. 2, pp. 155-159; February 1959. ABSTRACT: The E layer is situated in the middle ionosphere; its lower boundary is at a level of about 100 km when the sun is vertical. Its maximum ionization density is of the order of 10^5 electrons per cc but this varies by about 50 to 60 per cent in the course of the sunspot cycle. The production of ionization in the E layer is due to solar photons, most probably of X-ray character. The disappearance of electrons in the E layer is by way of dissociative recombination between electrons and positive molecular ions. E-layer morphology is influenced to a slight extent by horizontal currents flowing in it across the horizontal geomagnetic field; in other words, the E layer is a motor. It is generally considered that such currents are produced by dynamo action in the E layer due mainly to a diurnal horizontal tidal motion of the conducting medium across the earth's vertical magnetic force. The rough parallelism of the intensity of these horizontal currents with E-layer conductivity during the sunspot cycle suggests the simple result that the diurnal horizontal motion itself does not vary substantially with solar activity. (a-1, b-1, c-1, d-1, e-0, f-Study)

4004. BROWN, J. M., "Automatic Sweep-Frequency Ionosphere Recorder Model C-4," Proc. IRE, vol. 47, no. 2, pp. 296-300; February 1959. ABSTRACT: The equipment includes improvements in output power, receiver sensitivity, purity of output signal, and other details, over earlier equipment. The basic principles of operation are described and the tranceiver-type of circuitry explained. The operating characteristics are: frequency range, 1-25 Mc/s; output power 10-30 kW peak pulse power; pulse length, 50 µsec; repetition rate, variable from 10-70 pulses per second. An elaborate control and programming system is provided which can be used to operate the equipment on an unattended automatic basis. The "virtual height" of the ionospheric layers, as a function of frequency, is recorded on photographic film by two cameras - a 35 mm uniformly-moving-film unit, and a frame-by-frame 16 mm camera, which produces time-lapse motion pictures of the changes which occur. A brief history of the development of the sweep-frequency recorder technique is given. (a-3, b-1, c-1, d-1, e-0, f-Description)

4005. GIBBONS, J. J., AND WAYNICK, A. H., "The Normal D Region of the Ionosphere," Proc. IRE, vol. 47, no. 2, pp. 160-161; February 1959. ABSTRACT: The general theory of low-frequency sounding in the lower ionosphere is discussed in order to indicate the radio transmission characteristics which a D-layer model must satisfy. D layers based on the fundamental physical processes from 60 to 90 km, which have been presented up to now, have not been completely satisfactory. There is indication that the more accurately determined values of fundamental parameters now available, such as reaction rates, will lead to a more satisfactory model. (a-1, b-1, c-1, d-1, e-0, f-Study)

4006. MAEDA, K., AND SATO, T., "The F Region during Magnetic Storms," Proc. IRE, vol. 47, no. 2, pp. 232-239; February 1959. ABSTRACT: The results are described of statistical investigations made in the F region during magnetic storms. The characteristics of the daily variation of the deviation from the mean critical frequency and of the height of the maximum electron density, Δf_sF_2 and Δh_pF_2, respectively, are shown over the wide range of latitude from the equator to the auroral zone and for the principal seasons of the year. After a brief survey of theories to interpret the observed results, it is shown that the ionization-drift theory, which is associated with the dynamo theory, is almost satisfactory for the consistent interpretation of the various facts observed. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

4007. MARTYN, D. F., "The Normal F Region of the Ionosphere," Proc. IRE, vol. 47, no. 2, pp. 147-155; February 1959. ABSTRACT: The global morphologies of the F_1 and F_2 regions at magnetically quiet times are reviewed, and attention also is given to the sunspot-cycle variations. The physical conditions, temperature, pressure, recombination coefficients, and collision frequencies are reassessed in the light of recent studies of rocket and satellite results and of diffusion. The theory of the F region is reviewed with special attention to Bradbury's hypothesis and to the effects of transport of ionization. Also considered are the morphology of "spread-F" and radio star scintillation phenomena. A theory of the latter is outlined, and it is shown that the undersurface of the F region is unstable at times of upward drift, which appear to be the times when such phenomena are prominent. (a-1, b-1, c-1, d-1, e-0, f-Propagation theory)

4008. REUSS, M. L., "Some Design Considerations Concerning Linear Arrays having Dolph-Tchebycheff Amplitude Distributions," NRL Report 5240. See also Department of Commerce PB151231; February 1959. ABSTRACT: Two particular problems encountered in the design of traveling-wave arrays for scanning have been studied for arrays having Dolph-Tchebycheff amplitude distributions. The first problem concerns the effect that deforming the amplitude distribution has on the radiation patterns. Radiation patterns have been calculated as a function of the number of elements, side-lobe level, and amount of distortion. The second problem concerns the calculation of gains of infinitesimal dipole arrays. The parameters studied are the side-lobe level, number of elements, and interelement spacing. (a-3, b-3, c-1, d-1, e-0, f-Investigation)

4009. WHALE, H. A., "The Effects of Ionospheric Irregularities and the Auroral Zone on the Bearings of Short-Wave Radio Signals," J. atmos. terrest. Phys., vol. 13, no. 3-4, pp. 258-270; February 1959. ABSTRACT: The nature of the observed variations in the received bearing of the signals from short-wave radio stations at various distances is discussed and the origins of some of the effects are suggested. The major part of the daily variation of bearing of stations up to about 15,000 km distant arises from the refraction of the ray in the F1-region when it is reflected from the F2-region. A discussion of the curving of the ray path by successive small changes of direction at each reflection point leads to the concept of an antipodal area replacing the geometrical antipodal point. The large changes in direction associated with the passage of a ray through the auroral regions suggest a method of plotting the shape of the absorbing parts of the auroral zone by observations at a place remote from this zone. A sample plot obtained by this method is presented. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

4010. WONG, J. Y., AND LOH, S. C., "Calculated Radiation Resistance of Elliptical Loop Antenna with Constant Current," Brit. IRE J., vol. 19, no. 2, pp. 89-91; February 1959. ABSTRACT: Approximate formulas for radiation resistance of small and large loop antennas of elliptical shape are derived by Poynting vector method based on assumption of uniform current distribution on the loop conductor. Some calculations of radiation resistance are presented for loops of different sizes and shapes in order to illustrate derived results. (a-3, b-1, c-1, d-5, e-0, f-Mathematical analysis)

4011. POSS, E., "Improved Airborne Direction Finder," New York University College of Engineering, New York, Quarterly Report No. 3, Contract No. DA 36-039-sc-75074, ASTIA No. AD-219 424; 7 February 1959. ABSTRACT: Shielded room tests of the coherent and non-coherent modulation identifying systems indicate that in the presence of locked, modulated or unmodulated, carrier interference both systems can give nearly satisfactory performance. Descriptions and performance are presented for the IADF-1 non-coherent system, the IADF-2 coherent system, the IADF-3 coherent system, and the IADF-4 coherent system. Superior performance of the IADF-1 non-coherent system in the presence of both random noise interference and unlocked unmodulated carrier interference indicates the desirability of concentrating on this non-coherent approach. (a-3, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 3955)

4012. LEVIS, C., "Improved Direction-Finding Capabilities for Electronic Reconnaissance Systems," Antenna Laboratories, Ohio State University Research Foundation, Columbus, Ohio, Report No. 667-27, Contract No. AF 33(616)3353, ASTIA No. AD-305 922; 15 February 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4013. BARTHEL, D. H., BATES, J. K., ET AL., "Airborne Electronic (Ferret) Reconnaissance Techniques," ITT Laboratories, Nutley, New Jersey, Interim Report No. 17, Contract No. AF 33(600)-27521, ASTIA No. AD-306 462; March 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4014. BURTNYK, N., "Measurement of Polarization Errors of an Eight-Element and a Four-Element Adcock Antenna," National Research Council of Canada, Report ERB-503; March 1959. ABSTRACT: Results are presented of polarization error measurements made on a fat four-element and a thin eight-element Adcock

antenna system, each feeding an identical twin-channel direction-finding receiver. The effect of random polarisation of the received wave on the variance is investigated and comparative "bearing versus time" records for the two systems are shown. (a-1, b-3, c-1, d-7, e-695, f-Experimental results)

4015. GARDNER, F. F., "The Effect of Sudden Ionospheric Disturbances on 2.28 Mc/s Pulse Reflections from the Lower Ionosphere," Australian J. Phys., vol. 12, no. 1, pp. 41-53; March 1959. ABSTRACT: The effects of sudden ionospheric disturbances (S.I.D.'s) on the complicated structure of ionospheric echoes obtained with moderately high sensitivity at 2.28 Mc/s are described. The observations indicate that flares of classes 2 and 3 can produce high values of electron density near the base of the ionosphere. Mean electron density can exceed 1000/cm^3 over the height range 60-75 km, where the greatest relative increase in ionisation occurs. Nevertheless, the greater part of the S.I.D. absorption of waves reflected from the E region or above still occurs above 85 km. The times of maximum disturbance at the different ionospheric levels agree within the experimental limit of about 1 min. The times of subsequent recovery at levels up to 85 km also seem to be simultaneous. However, the recovery of the E echo lags behind that of the 85-90 km echo group, by about 4 min on the average for large S.I.D.'s. It is quite likely that the delay is not wholly due to different recombination rates at different ionospheric levels, but is partly caused by a change in the quality of the incoming solar radiation during the life of the flare. (a-1, b-1, c-1, d-11, e-0, f-Analysis)

4016. HAWKES, H. W., "New Method of Generating Rotating Radiation Polar Diagram," Proc. IEE, vol. 106, Part B, no. 26, pp. 158-169; March 1959. ABSTRACT: Method by means of which operating frequency of navigational aids can be set in 100 Mc region; method consists of rotating aerial array of small mechanical dimensions and allowing it to be coupled electrically to static array of very large dimensions so as to produce final radiation which makes rotatable array appear to have large dimensions of static array. (a-3, b-1, c-1, d-5, e-0, f-Description)

4017. HULST, G. D., "Inverse Ionosphere," IRE Nat. Conv. Record, vol. 7, no. 8, pp. 167-174; March 1959. ABSTRACT: The distortion introduced into a long range communication system by unpredictable multipath conditions of the ionosphere is described in this paper. A device to eliminate this particular form of distortion is then described, using a sensing technique, a logical matrix, and a signal restoration network. Since both the multipath model of the ionosphere and the restoration network are linear, the principles of superposition apply to the cascaded combination so that the described technique is generally applicable to all waveforms. Specific restoration networks are described for several typical ionosphere multipath conditions. The effects of white noise upon the correction network and the signal are noted. The inverse instrumentation can be placed in the system either as a restoration network at the receiver or as a pre-distorting network at the transmitter. (a-1, b-1, c-1, d-1, e-764, f-Analysis)

4018. MARKHAM, A. S., "Radio-Compass Testing with Small Shielded Enclosures," Trans. IRE, vol. ANE-6, no. 1, pp. 4-8; March 1959. ABSTRACT: A method is described by which radio compasses may be tested using small shielded enclosures (24 by 24 by 24 inch) for many loop types instead of screen rooms. This procedure results in economies of cost and space, as well as providing portability and rapid setup. Application of accepted methods of determining field strength for calibration purposes is discussed. Enclosure modifications for utilization of flush loops and the incorporation of rotation facilities for loop bearing-accuracy tests are also covered. Some approaches to enclosure design and construction are described, and examples of different types of existing and proposed units are shown. The possibility of using a small enclosure within an existing screen room as an aid in curing serious noise and interference problems, as an inexpensive substitute for renovating or replacing the screen room, or as a means for locating sources of noise or other disturbances, such as stray fields and rf leakage from signal generators, is also described. (a-3, b-1, c-1, d-1, d-0, f-Description)

4019. POKRAS, A. M., "Selection of Form of Aperture for Radiator and Super Radiator," Elektrosvyas, vol. 13, no. 3; March 1959. ABSTRACT: Consideration supporting choice of rhombic aperture of mirrors in certain type of directional antennas. (a-3, b-2, c-2, d-2, e-0, f-Discussion)

4020. RAUDENBUSH, C., "Development and Demonstration of a Proximity Warning System," Motorola, Incorporated, Riverside, California, Final Report, Contract No. AF 04(616)4046, ASTIA No. AD-214 865; March 1959. ABSTRACT: Efforts were made to demonstrate the feasibility of a proximity warning indicator system compounded of 2 different ideas. One was an instantaneous direction finding method based on phase measurements between the signals received on 3 antennas arranged in an equi-lateral triangle. The other was a method for determining range and closure rate based on meaconing. The flight tests were conducted in 2 phases, the first involving only the ranging capabilities, and the second both range and direction finding functions. The tests demonstrated 2 positive facts which point the way to a simple, cooperative, anticollision aid. These are: (1) relatively simple, lightweight equipment operating in the vhf band is capable of pulse operation with sufficient definition to determine the range between 2 planes, and (2) the relative bearing between the 2 planes can be determined simultaneously with the range measurement. Motorola has proceeded in the development of a nonmeaconing PWI system which is capable of operation in a multiplane situation. (a-3, b-3, c-1, d-1, e-0, f-Description)

4021. WAIT, J. R., "Downcoming Radio Waves, Measurement of Characteristics," Electronic Radio Engnr., p. 106; March 1959. ABSTRACT: It is the purpose of this article to outline a scheme for measuring the angle of arrival, azimuth, and polarisation of a downcoming radio wave. Despite the existence of extensive literature on the subject of polarization errors in direction finders and related subjects, there does not seem to have been a method available for analysing the characteristics of an arbitrary downcoming plane wave from measurements made on the ground. Essentially, there are four quantities needed to characterize the incident wave completely: azimuth α, elevation angle θ, and electric field components E" and E' parallel and perpendicular to the plane of incidence, respectively. Two of these quantities, E" and E' are complex. In most cases, however, a knowledge of the magnitudes and relative phase between E" and E' is all that is required. In view of these facts, it is believed that the simplest scheme to accomplish the task consists of a crossed-loop direction finder operating in combination with a four-element-type Adcock aerial. (a-1, b-2, c-1, d-5, e-566, f-Study)

4022. JEFFERSON, F. W., "Evaluation of the Design Approval Model AN/ALA-12(XN-1) Direction Finder Antenna System," Naval Air Test Center, Patuxent River, Maryland, Final Report, ASTIA No. AD-305 974L; 9 March 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4023. COKER, Q. W., TRAVERS, D. N., AND DONALDSON, W. L., "Final Report on the Use of VHF and UHF Direction Finders in Air Traffic Control Systems," Contract FAA/BRD-22, Southwest Research Institute; 16 March 1959. ABSTRACT NO. 1: This report contains a brief review of all direction finding systems including wide aperture systems and inverse Loran. ABSTRACT NO. 2: This report supplies detailed information related to the use of existing VHF and UHF radio direction finders in air traffic control systems. This report also considers direction finding systems in general with summary information which describes the state of the art at the time of report preparation. It is reported that if certain modern Doppler direction finders were to be used in the existing air traffic control system, for the purpose of increasing the determination accuracy of aircraft azimuth bearings, the determination accuracy which could be accomplished would be improved by a factor of approximately three over that which is now achieved according to published information. Specific equipments have been surveyed within the limits of available information (a_1-4, a_2-1, b-3, c-1, d-1, e-1000, f-Survey)

4024. HIBBS, H. H., AND PURO, W. O., "Cotar System Circularly Polarized Antenna," Melpar, Incorporated, Falls Church, Virginia, Final Report, Contract No. AF 08(606)2686, ASTIA No. AD-214 626; 28 March 1959. ABSTRACT: The development and fabrication are presented of a VHF circularly-polarized Cotar system antenna. Antennas of this type could be used in place of the vertically-polarized monopole antennas presently used with the Cotar system to provide reception to any linear polarization to aid in missile tracking. Major characteristics required in the antennas are nearly hemispherical radiation coverage, circular polarization over the region of coverage, and location of the antenna phase center to within ±0.005 inch. A circularly-polarized discone was developed which yielded near hemispherical radiation coverage and a good degree of circular polarization over this radiation region. Due to the size of the antenna and available fabrication techniques, the phase center could not be located to the desired tolerance; however, it was located to within ±0.050 in., or approximately ±0.001λ. Of particular interest are the phase measuring technique and the accuracies to which these measurements could be made even at VHF. (a-1, b-3, c-1, d-1, e-0, f-Description)

4025. BAUER, A. S., AND SPANGLER, R., "Design and Development of Homing Loop Antenna AT-784/PRC," Admiral Corporation, Chicago, Illinois, Final Report, Contract No. DA 36-039-sc-75024, ASTIA No. AD-217 747; 31 March 1959. ABSTRACT: Design and development data are presented for the compact, hand held, homing loop antenna. This antenna is to be used with the AN/PRC-25, AN/PRC-35, and AN/VRC-12 radio sets to determine the direction of received radio signals in the 30 to 76 mc range. The 2 homing antennas considered were the air-loop antenna and the ferrite-loop antenna. Development antenna models are presented. The sensitivity of the ferrite-cored loop antenna was lower than that of the air-loop antenna due to form and shielding. (a-3, b-3, c-1, d-1, e-0, f-Description)

4026. GOLLA, E. F., ZALEWSKI, W., ET AL., "Study and Investigation of Extremely High Altitude Ferret Reconnaissance Techniques," Haller, Raymond, and Brown, Incorporated, State College, Pennsylvania, Quarterly Report No. 5, Contract No. AF 33(616)5471, ASTIA No. AD-306 427L; 31 March 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4027. SHUBERT, H. A., "Evaluation of a Laboratory Model Injection Type RDF Receiver," Electrical Engineering Research Laboratories, University of Illinois, Urbana, Illinois, Technical Report No. 12, Contract No. 183402, ASTIA No. AD-225 274. See also Department of Commerce PB146357; 31 March 1959. ABSTRACT: Descriptions and data are presented on the construction and operation under laboratory conditions of a 2-channel radio direction finding (RDF) receiver matched in phase and gain automatically. The channels are matched by means of a signal injection system. Schematic diagrams, explanations of operation, and photographs and analysis of results are presented. A review of the general principles of operation of a direct reading RDF system with emphasis on the details pertinent to this project is given. An attempt was made to show why the requirements on the receiver are very rigid. The principles of operation of the injection system for channel matching, and an explanation of the construction of the system used are outlined. An analysis is presented of results obtained, in which the results are compared to theoretical calculations and curves. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

4028. BATEMAN, R. J. W., FINNEY, E. K., SMITH, L. H. T., AND WATTS, J. M., "IGY Observations of F-Layer Scatter in the Far East," J. Geophys. Research, vol. 64, no. 4, pp. 403-405; April 1959. ABSTRACT: Peculiar signal enhancements observed during transmissions at 36 to 50 Mc/s between the Philippines and Okinawa appear to represent F-layer scatter. These signals are observed nightly for periods of several hours during the months of September and October. Pulse tests indicate F-layer heights for these signals. Considerable pulse broadening is observed and the signals generally arrive from somewhat off the great circle path. (a-3, b-1, c-1, d-1, e-0, f-Ionospheric observation report)

4029. BENOIT, R. C., JR., AND COUGHLIN, F., JR., "Designing R.D.F. Antennas," Electron. Ind., vol. 18, no. 4, pp. 77-83; April 1959. ABSTRACT: A brief discussion of the properties of Adcock, Doppler and Wullenweber aerial systems particularly at VHF. It is concluded that for most applications the Doppler type is the most suitable even though better all round performance can be attained by the Wullenweber system - where cost is no object. Although narrow aperture systems are simplest and cheapest they are only to be recommended where first-class sites are available. (a-4, b-2, c-1, d-1, e-353, f-Theory and experiment, 16 references)

4030. DRANE, C., "Phase Modulated Antennas," Air Force Cambridge Research Center, Technical Report 59-138; April 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4031. HARRINGTON, R. F., "On Scattering by Large Conducting Bodies," Trans. IRE, vol. AP-7, no. 2, pp. 150-153; April 1959. ABSTRACT: Two sets of sources, equivalent in the sense that they produce the same field as does an illuminated conductor, are discussed. Both representations are suggestive of approximation. Crude approximations are made, yielding what are called "the physical optics solution," and the "image induction solution." It is shown that these two solutions are reciprocal to each other. This means that, given a source and an observer, the solution by one method is equal to the solution by the other method with the source and observer interchanged. Both solutions are amenable to further refinement if more accurate solutions are desired. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4032. LEICHTER, M., "Beam Pointing Errors of Long Line Sources," Hughes Aircraft Company, Culver City, California, Technical Memo No. 588, Contract No. AF 30(602)1718, ASTIA No. AD-226 367. See also Department of Commerce PB143606; April 1959. ABSTRACT: The relation between the statistics of the antenna beam pointing direction and the phase and amplitude errors at the source was obtained to first order in the mean square errors, under certain restrictions, for long line sources. When the desired phase at the source is a constant the results are, to first order, independent of the amplitude errors. When the desired amplitude is also constant there is a simple formula for computing the allowable rms phase error at the source when the pointing direction is required to lie in a given angular range with a given probability. When the amplitude distribution corresponds to the Taylor modified (sin x)/x pattern, the allowed rms phase error is obtained from the constant amplitude case by a multiplicative factor which depends only on the one parameter characterizing the Taylor distribution. This function is plotted for the range corresponding to sidelobe ratios of 13.2 to 40 db. At 40 db the allowed rms phase errors are about three fourths of the allowed rms phase errors at 13.2 db (constant amplitude) for the same uncertainty in the pointing direction. The results are applied to a hypothetical example and to an actual "Mills Cross" for illustrative purposes. (a-1, b-3, c-1, d-1, e-0, f-Theoretical analysis)

4033. MATTES, A., "Principles and Characteristics of the Long-Base Direction-Finder," Rohde u. Schwarz Mitt., no. 12, pp. 274-284; April 1959. ABSTRACT: Discusses the possibility of constructing a long-base direction-finder which gives satisfactory bearings even at sites containing obstructions. A description is then given of a newly developed NP-4 automatic vhf long-base direction-finder which operates on the Doppler principle. The characteristics of this system are studied and the results of various tests in different very unfavourable terrains, in particular in high mountains, are presented. (a-2, b-2, c-4, d-4, e-0, f-Description)

4034. POEHLMANN, W., AND EHRMANNTRAUT, R., "A Contribution to the Definition of the Bearing Sensitivity of Automatic Visual Direction Finders," Rohde u. Schwarz Mitt., no. 12, pp. 285-290; April 1959. ABSTRACT: It is possible to define the maximum range for automatic D/F equipment as the distance in which the field strength is so small that a definite determination of azimuth is impossible because of variations in indication caused by noise. For Adcock or Doppler D/F equipments, the rms value of the bearing indication fluctuations, is calculated at a given rf signal-to-noise ratio. In addition, a probability function is determined which gives the probability that the threshold value of fluctuating indications will be exceeded. (a-2, b-2, c-4, d-4, e-0, f-Analysis)

4035. MATSCHKE, A., "Bibliography on Electromagnetic Wave Propagation," Sylvania Electric Products, Inc., Electronic Defense Laboratory, Technical Memo No. EDL-M186; 1 April 1959. ABSTRACT: The purpose of this bibliography is to provide an up-to-date (1947-1958) reference to publications from laboratories foremost in their respective fields of upper atmospheric research, wave propagation, and wave scattering phenomena. The laboratories whose work in these fields has comprised the basis for this report are: Cavendish Laboratory, University of Cambridge; Electrical Engineering Department, Cornel University; Ionospheric Research Laboratory, the Pennsylvania State University; Radio Propagation Laboratory, Stanford University; Stanford Research Institute. (a-1, b-3, c-1, d-1, e-338, f-Bibliography)

4036. ORNSTEIN, E., "Attenuation of Electromagnetic Radiation by Sea Water," NRL Report 5280. See also Department of Commerce PB138310; 1 April 1959. ABSTRACT: Measured values of attenuation of electromagnetic radiation by sea water have been gathered from the literature. The measurements covering the frequency range 10^3 to 10^{21} cycles per second have been converted to a uniform attenuation scale (decibels per yard) and plotted. In general, the picture is one of attenuation rising with frequency through the communications, microwave, and infrared regions. The rise is ended by the visual-frequency "hole," and high values recur in the ultraviolet region of the spectrum. The limited data available indicate a gradual decline in attenuation from ultraviolet through the x-ray and gamma-ray regions. (a-3, b-3, c-1, d-1, e-0, f-Experiment and analysis)

4037. SCHMIEDER, R., "Test and Evaluation of Sperry Gyroscope Company Type C-6 Master Directional Indicator," Aeronautical Instruments Laboratory, Naval Air Development Center, Johnsville, Pennsylvania, ASTIA No. AD-220 122L; 1 April 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation test report)

4038. HATCH, J. F., AND BYATT, D. W. G., "Direction Finder with Automatic Readout," Electronics, vol. 32, no. 16, pp. 52-54; 17 April 1959. ABSTRACT: Accuracy of direction finder is improved by averaging readings to compensate for rapid changes in indications caused by deviation of wave from direct path between transmitter and receiver; device described detects position of goniometer shaft photoelectrically and converts it into pulses which operate decade counters; bearings are averaged over any reasonable period of time both for C-65 and interrupted transmission. (a-3, b-2, c-1, d-1, e-0, f-Description)

4039. TRAVERS, D. N., MOORE, J. D., DUBOIS, V. G., AND WORMSER, J. J., "Interim Progress on the Construction of a Three-Loop Prototype Antenna," Southwest Research Institute, Interim Report No. 17, Contract NObsr 64585; 26 April 1959. ABSTRACT: This report summarizes the engineering work which has been performed during the past three months towards the construction of a prototype three-loop antenna system for use with a modified AN/SRD-7 receiver. All of the work performed during this past quarter has been construction and fabrication of various components and sub-assemblies to be used in the antenna. All of the experimental and design work which was required preparatory to construction of this antenna has been completed for several weeks. A description is given of some of the components and important sub-assemblies to be used in the antenna. The completed rotary printed circuit transformer is described and shown in the photographs. Components and parts which are involved in the tuning turret are described. The problems involved in converting the existing automatic calibrator equipment for use with this prototype three-loop antenna are reviewed. All experimental work on the calibrator is complete, although the adapting modifications which will be introduced have not as yet progressed beyond a planning stage. The modification which will be performed is a simple one utilizing a manual observed bearing follower for conditions other than the pure simple loop. Because of insufficient time available for the necessary analytical and experimental work to determine the optimum method of calibrating the varying three-loop pattern, a manual observed bearing follower will be used. In anticipation of completion of the construction and testing of the three-loop prototype antenna and a corresponding return to the more basic aspects of the problem of reradiation and bearing error calibration, the work which has been performed toward planning of future work is reviewed. (a-1, b-3, c-1, d-1, e-1000, f-Interim report. See Abstract No. 4000)

4040. ANONYMOUS, "Flight Test Evaluation of A Limited AN/TLQ-8 Direction Finder System," Thompson Ramo Wooldridge, Incorporated, Los Angeles, California, Contract No. AF 30(602)1687, ASTIA No. AD-308 183; 27 April 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4041. ANONYMOUS, "Antenna Control Group OA-( )/TRD," Belock Instrument Corporation, College Point, New York, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-78110, ASTIA No. AD-227 011; May 1959. ABSTRACT: The main emphasis has been on completing the manufacture of the prototype unit. All of the components have been completed with the exception of the motor-generator set and servo motor. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 3950)

4042. AGGARWAL, K. K., "Statistical Analysis of Fading on Short-Wave Transmissions," J. Instn. Telecomm. Engrs., (New Delhi), vol. 5 no. 4, pp. 230-237; September 1959. ABSTRACT: A statistical analysis is presented of fading records taken on oblique-incidence mc transmissions as well as on pulsed transmissions at vertical incidence. The amplitude distributions of some of the random fading curves are shown. It was observed that the probability distributions of the amplitude in such fading curves ar the conventional Rayleigh, Gaussian and log normal type. Auto-correlograms of the fading curves were also determined in a few cases and are presented. Fading records of the oblique-incidence cw transmissions were compared with those taken simultaneously on vertical incidence pulsed transmission at the equivalent vertical incidence frequencies. (a-3, b-1, c-1, d-8, e-0, f-Analysis)

4043. ANDERSON, S. R., AND FLINT, R. B., "The C.A.A. Doppler Omnirange," Proc. Inst. IRE, vol. 47, no. 5(I), pp. 808-821; May 1959. ABSTRACT: Describes a vhf omnirange, the operation of which is based upon an application of the Doppler effect. Progress in the development of a Doppler V.O.R. is outlined. The Doppler V.O.R. has a measured 7-to-1 improvement with respect to siting effects when compared to the conventional four-loop vhf omnirange. The wave transmitted by the Doppler V.O.R. is horizontally polarized. The unique interchange in the functions of the 30 c/s amplitude modulation and the 30 c/s frequency modulation of a 9.96 kc/s subcarrier is described. The Doppler V.O.R. is shown to be compatible with present vhf omnirange receiving equipment. The results reported were obtained by experimentation and mathematical analysis. (a-3, b-1, c-1, d-1, e-0, f-Description)

4044. GALBRAITH, H. J., "Personnel Navigation System Study," Motorola, Incorporated, Riverside, California, Report No. RLF-3838, ASTIA No. AD-227 998. See also Department of Commerce PB146981; May 1959. ABSTRACT: A detailed design proposal for a lightweight manpack personnel navigation equipment is presented. The Appendixes support the proposed equipment design and constitute a final report on all phases of the theoretical and experimental investigations of applicable motional sensors, directional references and navigation techniques. The equipment embodies an ultrasonic Doppler velocity sensor, a magnetic directional reference and an operational-digital navigation computer and indicator. The unique features of the proposed design include a novel frequency tracking scheme, an all-electronic method of reading out magnetic heading and pulse-train digital computing techniques. The feasibility of magnetic velocity determination and algebraic-inertial navigation techniques were also investigated. The experimental effort included the fabrication and testing of ultrasonic Doppler transducers, simulators, and associated circuitry, magnetic heading reference circuitry, and magnetic field measuring devices. The human factors aspect of a personnel navigator were investigated and an experiment was conducted to obtain measurements of linear and angular accelerations that may be expected of a man carrying the navigation equipment. (a-1, b-3, c-1, d-1, e-0, f-Study)

4045. JOLLIFFE, S. A. W., "The Place of V.H.F. Direction Finders in Air Traffic Control. I-II," Brit. Commun. and Electronics, vol. 6, no. 4, pp. 270-275; April: no. 5, pp. 358-363; May 1959. ABSTRACT: These articles, after briefly tracing the history of direction finding, are primarily concerned with ground based systems operating in the vhf aeronautical communication band, 100-156 Mc/s. The practical application of the modern direction finder to the problems of aircraft navigation are considered in part II, and where possible, systems are compared in terms of technical performance and capital and operating cost. Factors limiting the accuracy are discussed and future developments are indicated. (a-2, b-2, c-1, d-5, e-0, f-Survey)

4046. LANGENDORF, P. M., "The Philosophy of the General Problem of Search and Detection," Rome Air Development Center, Griffiss Air Force Base, New York, Report No. RADC TN 59-130, ASTIA No. AD-213 583; May 1959. ABSTRACT: A study was conducted to discover the way a detection system should operate to maximize detection in the absence of information regarding the signal to be detected. The results of this study indicate that the best methods of search can be developed for any transmitter without time cycle, or one whose time cycle is known. If a transmitter is operating for less time than the receiver requires for a search cycle, the maximum probability of detecting this transmitter is the ratio of duration of transmission to length of search of cycle. (a-1, b-3, c-1, d-1, e-0, f-Study)

4047. MARIANI, F., "The World Wide Distribution of the F2 Layer Electron Density. Seasonal and Non-Seasonal Variations and Correlations with Solar Activity," Nuovo Cimento, vol. 12, Series 10, no. 3, pp. 218-240; May 1959. ABSTRACT: Not available. (a-4, b-2, c-9, d-9, e-0, f-Study)

4048. RICHTER, F. G., "Direction Finder Set AN/TRD-15(XE-1) and AN/TRD-15(XE-2)," Servo Corporation of America, New Hyde Park, New York, Final Report, Contract No. DA 36-039-sc-72809, ASTIA No. AD-220 826; May 1959. ABSTRACT: Direction Finder Sets AN/TRD-15(XE-1) and AN/TRD-15(XE-2) cover the frequency range of 1.5 to 20 mc with automatic cathode-ray tube presentation of bearing information. The systems utilize the commutated fixed antenna version of the circular path doppler direction finder principle. Model XE-1 provides a single display of bearing information on any signal encountered in the frequency range of the equipment. Model XE-2 provides two independent displays of bearing information on any two signals encountered and operates from the standard antenna array. This report covers the work performed during the full term of the development of Direction Finder Sets AN/TRD-15(XE-1) and AN/TRD-15 (XE-2). During this interval prototypes of each equipment were constructed and evaluated. This report summarizes the field performance of these equipments and describes the theoretical and practical design problems encountered during the development program. See also AD-210 586. (a-1, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 3965)

4049 SOCLOF, S. I., "Two Interferometer-Type Direction-Finding Systems," Research Institute, University of Michigan, Ann Arbor, Michigan, Technical Report No. 89, Contract No. DA 36-039-sc-78283, ASTIA No. AD-220 503; May 1959. ABSTRACT: The analyses of 2 types of radio direction-finder are presented. These systems were investigated primarily with the VHF frequency range in mind. The analysis of the systems is presented for the purpose of indicating one way of instrumenting an interferometer system and to indicate a way of eliminating the ambiguities involved. Some discussion is given on the limitations of such systems. As with most direction finders in this frequency range and lower, the limitation on accuracy is a function of the environment and not solely dependent upon the instrumental accuracy of the equipment. (a-1, b-3, c-1, d-1, e-919, f-Study and analysis)

4050. WONG, J. Y., AND THOMAS, R. S., "Bibliography on the Helical Beam Antenna," Radio and Electrical Engineering Division, National Research Council of Canada, Report No. ERA-344, ASTIA No. AD-225 164; May 1959. ABSTRACT: This report contains 66 abstracts of papers and reports on the helical beam antenna. The purpose is to provide a ready source of information to workers in this field. (a-1, b-3, c-1, d-7, e-0, f-Bibliography)

4051. ANONYMOUS, "Antenna Control Group OA-( )/TRD," Belock Instrument Corporation, College Point, New York, Quarterly Report No. 3, Contract No. DA 36-039-sc-78110, ASTIA No. AD-227 011; 1 May 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4052. ANONYMOUS, "List of Technical Translations," National Research Council of Canada, Library, Ottawa, Translation Section; 1 May 1959. ABSTRACT: The National Research Council Library maintains a translations section to prepare English translations of foreign language scientific and technical papers of particular interest to the research staff of the Council. These translations are published in the Council's technical translations (TT) series, and made available to the scientific community at large. A nominal charge is made in certain cases, but within the limits of the small stock, complimentary copies may be supplied to the libraries of universities and, on a translations exchange basis, to certain other organizations. Some of the earlier translations are out of print, but photocopies may be ordered. A supplement to the list and a revised author index will be issued whenever an additional one hundred translations have been completed. Translations prepared by the National Research Council, as well as many others prepared in Canada, are reported to the Aslib Commonwealth Index of Scientific Translations in London. They are also listed in Technical Translations issued by the Office of Technical Services, Department of Commerce, Washington, D.C. Technical Translations supersedes Translations Monthly prepared by SKA, to which Canadian translations were previously reported. (a-1, b-3, c-1, d-7, e-337, f-Periodically revised list of translations. Many D/F papers)

4053. ANONYMOUS, "Position-Velocity Determination and Deghosting in the Multisinull Antenna System," General Atronics Corp., Bala-Cynwyd, Pennsylvania, Report No. 540-165-20, Contract No. AF 30(602)1858, ASTIA No. AD-324 189; 8 May 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4054. ANONYMOUS, "Marine Fleet (Selected Articles)," Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio Translation No. MCL-662 from Morskoy Flot 6, ASTIA No. AD-255 409; June 1959. ABSTRACT: Contents include the possibility of employing electronic digital computers in ship handling, Night Effect in operation of omnirange, and omnidirectional radio ranges with phase control of directivity pattern. (a-3, b-3, c-1, d-0, e-0, f-Description)

4055. AIZENBERG, G. Z., "Traveling Wave Antenna with Resistive Coupling," Radio Eng., vol. 14, no. 6, pp. 1-18; 1959. ABSTRACT: Traveling wave antennae with resistive coupling (TR antennae) have recently been widely used in the radio centres of the U.S.S.R. Up to the present, however, no sufficiently detailed information describing the properties of such antennae has yet appeared in the literature. This article includes graphs of the parameters of TR antennae and comparative data which indicates the advantages to be derived from this antenna in comparison with the other types of antenna. No formulae are derived which enable the gain of the traveling wave antenna to be determined for the different radiation patterns. (a-5, b-2, c-1, d-7, e-435, f-Analysis and design - considerations)

4056. BARBER, N. F., "Design of 'Optimum' Arrays for Direction-Finding," Electronic Radio Engr., vol. 36, no. 6, pp. 222-232; June 1959. ABSTRACT: A consideration of the factors affecting the design of directional aerials for radio-astronomy observations. A general expression is derived for the power density of an incoming spectrum received by an array. It is shown that an "optimum" array must possess positive and negative side lobes in addition to a narrow central peak if it is to yield maximum information. The characteristics of number of optimum arrays in one and two dimensions are discussed as well as the properties of some suitable super-directive arrays. A brief review of previously used aerials is included. (a-3, b-2, c-1, d-5, e-463, f-Design analysis)

4057. BOND, G. W., "Measurement of Air Navigation Accuracy along Certain VOR Airways," Armour Research Foundation, Chicago, Illinois, Final Report on Contract FAA/BRD-28. See also Department of Commerce PB161652; June 1959. ABSTRACT: During the winter of 1958-59 a large number of measurements were made, by means of a long-range radar, of the accuracy of air navigation along certain VOR airways within 130 miles of Kansas City. The measurements encompassed a variety of aircraft types and flight conditions, and were made generally without the pilots knowledge. The type, identity, assigned altitude, origin, destination, and reported times over certain VOR station were obtained for each aircraft from air traffic control records. Related weather and winds aloft data were obtained from the weather teletype. The positions of the VOR radials defining the airways in the area were also measured, by means of a specially instrumented aircraft. (a-3, b-3, c-1, d-1, e-0, f-Summary report)

4058. BRODZINSKY, A., "Electronic Landing Aids for Carrier Aircraft," Trans. IRE, vol. ANE-6, no. 2, pp. 95-99; June 1959. ABSTRACT: A brief background of the problem is presented. The most recently developed fully automatic landing system consists of a three-coordinate tracking radar which provides closed-loop control through a ground-based computer, a ground-to-air data link and an autopilot in the aircraft. Recent successful sea trials indicate that the characteristics of this system are sufficiently accurate to provide a practical solution for the carrier landing problem. (a-3, b-1, c-1, d-1, e-0, f-Survey and evaluation)

4059. CUTLER, B., AND SANDERS, L., "Regal - An Advanced Approach and Landing System," Trans. IRE, vol. ANE-7, no. 2, pp. 135-142; June 1959. ABSTRACT: Ground-based scanning beams set up a broad reference grid in space from which aircraft may determine their position and optimumly determine the landing manoeuvre. A breadboard system was designed and tested in 1957 and 1958, and the F.A.A. experimental elevation system will be tested in 1959. Theory of the radar ground-reflection problem is discussed and empirical data are presented to validate conclusions. (a-3, b-1, c-1, d-1, e-0, f-Description)

4060. GOLDSTEIN, H., AND CUTLER, B., "The AN/MSN-3: An Automatic Ground-Controlled Approach System," Trans. IRE, vol. ANE-6, no. 2; June 1959. ABSTRACT: A system is described whereby information gathered by a standard g.c.a. radar is utilised to compute automatically all g.c.a. approach-control commands; these commands are then transmitted simultaneously to a maximum of six aircraft via the U.S.A.F. frequency-division digital data link for automatic control of the aircraft approach. The system is designed to enable continuous human monitoring of the a.g.c.a. traffic-control operation and to include visual and aural warning signals in the monitoring system for added safety. Problems relating to optimum system response and gain parameters are discussed and control equations are defined. Results of extensive testing demonstrate a system capable of providing smooth control during the aircraft final approach under high-density traffic conditions. System accuracy is well within specified limits of ±50 ft in azimuth and ±30 ft in elevation at a minimum release point 100 ft above the runway. (a-3, b-1, c-1, d-1, e-0, f-Description)

4061. ERUKHIMOVICH, YU. A., "On the Possibility of Constructing an Automatic Direction Finder," Radiotekhnika, vol. 14, no. 6, p. 63; June 1959. ABSTRACT: Fundamentally the use of the properties of non-linear elements offers a method of converting antenna radiation diagrams in an indicator by transforming its form according to the multiple harmonics of the fundamental frequency. The determined advantages of an automatic radio direction finder constructed in this manner over existing devices are shown. Also proposed is a new principle of determining the direction of a signal, which can be used in the ordinary twin-channel radio direction finders. (a-5, b-2, c-2, d-2, e-352, f-Theory)

4062. IDEN, F. W., "Glide-Slope Antenna Arrays for Use under Adverse Siting Conditions," Trans. IRE, vol. ANE-6, no. 2, pp. 100-111; June 1959. ABSTRACT: The problems of generation of an adequate glide-slope signal on a practical airport site are examined, with particular attention to the path-shape degradation introduced by inadequate smooth surface in the primary reflecting area, and hills and similar mirror obstructions under the approach line. Quality factors are derived to establish comparison standards to evaluate the relative performance to be expected in application of various of the available arrays to any particular site. Two arrays are described, which have been found to provide substantial improvement in certain of these defective sites. (a-3, b-1, c-1, d-1, e-0, f-Investigation)

4063. LUTZ, S. G., LOSEE, F. A., AND LADD, A. W., "Pulse Phase-Change Signaling in the Presence of Ionospheric Multipath Distortion," IRE Trans. Commun. Syst., vol. CS-7, no. 2, pp. 102-110; June 1959. ABSTRACT: Ionospherically propagated signals generally arrive by multiple paths having different and gradually changing time delays which cause multipath distortion. Interference fading and delay-difference smearing are the principle manifestations of this distortion. The technique of alternately transmitting (1-ms) and short (20-μs) pulses was developed to study multipath smearing and to determine whether the rates of change of phase would permit the use of phase-change signalling systems. Tests were conducted which confirmed the frequent occurrence of abrupt phase changes during reception of any one pulse, but established that the rate of phase-change between corresponding portions of successive pulses always was gradual. The phase-change signalling system that was developed as a result of this study is described. Data transmission (with millisecond pulses) over distances greater than 3000 km with negligible errors for prolonged periods was observed. (a-3, b-1, c-1, d-1, e-0, f-Propagation analysis)

4064. MERCIER, R. P., "The Propagation of Fading Waves," Phil. Mag., (Eighth Ser.), vol. 4, pp. 763-776; June 1959. ABSTRACT: Not available. (a-4, b-2, c-1, d-5, e-0, f-Theory)

4065. MINKOVICH, B. M., "The Problem of Quasi-Optimum Linear Co-Phased Antennas with Continuous Current Distribution," Radiotekhnika i Elektronika, vol. 4, no. 6, pp. 1057-1058; June 1959. Translation in Radio Engineering and Electronics. ABSTRACT: The possibility was proven of passage from optimum antennae consisting of discrete radiators to quasi-optimum antennae with continuous distribution of current in the antenna aperture. However, the expression presented by the authors for the amplitude distribution of currents in the antenna in the form of integral requires considerable numerical calculation; no recommendations are given for the choice of the relative magnitudes of side lobes R. (a-5, b-2, c-1, d-2, e-0, f-Theory)

4066. MIYA, K., AND MATSUSHITA, S., "Recording Type Direction Finder," Rep. Ionosphere Space Res. Japan, vol. 13, no. 2, pp. 120-122; June 1959. ABSTRACT: The direct-vision type direction-finder described has been adapted to study the characteristics of radio waves propagated via the ionosphere. A recording device has been added by means of which the bearing of the received wave is displayed directly on a pen recorder. (a-2, b-1, c-6, d-6, e-0, f-Description)

4067. WOYA, E., "The Antipodal Reception of Sputnik III," Proc. IRE, vol. 47, no. 6, p. 1144; June 1959. ABSTRACT: The permanent recording of satellite signals on 20 mc, carried out at Stanford, Calif., gave some important results. Garriott and Villard, Jr. found that during a period of several weeks, the signal was often detected at a time midway between two direct afternoon passes, while between the morning passes of the same period, practically no antipodal signal was detected. During the next period of about two months no antipodal reception could be noted at all. Practically all detected antipodal signals arrived from the southeast. The authors deduced from the constancy of the Doppler shift and from the direction of arrival that the arriving energy must have been confined to a relatively narrow cone in some unchanging direction. That was in a good agreement with the theoretical conclusions drawn by Woyk. (a-1, b-1, c-1, d-1, e-0, f-Observation)

4068. BADESSA, R. S., BATES, V. J., ET AL., "Phase Stabilization Techniques for Electronically Scanned Arrays," Res. Lab. of Electronics, MIT, Cambridge, Technical Report on Contract No. AF 30(602)1862, RADC-TR-59-44, AD-228707; 4 June 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description)

4069. KASEMIR, H. W., "A Simple Thunderstorm Warning Device," USASRDL Technical Report 2046; 15 June 1959. ABSTRACT: The first model of a thunderstorm warning device, using the dependence of the electrostatic field amplitude of lightning strokes on the distance to record the approach of a thunderstorm, is described. A warning bell or light can be set to give an alarm if the approaching thunderstorm underpasses a given distance which can be chosen between 10 and 150 miles. A plus-or-minus log recorder characteristic is applied to cover the wide variation of the field amplitude without range switching. The instrument is simple and inexpensive, and the maintenance is kept to a minimum. (a-5, b-3, c-1, d-1, e-0, f-Description)

4070. MATTSON, R. H., AND LIU, S. H., "Switching V. H. F. Power with Silicon Diodes," Electronics, vol. 32, no. 25, pp. 58-59; 19 June 1959. ABSTRACT: A diode switching system is described which can be used to connect a radio transmitter and receiver in an aircraft to either of two aerials. The diodes are alternately made conducting or biased-off by a square-wave voltage. Details are given of a small and simple design in which the diode is mounted within a coaxial T-connector. (a-3, b-2, c-1, d-1, e-0, f-Description)

4071. MIYA, K., AND KAWAI, M., "Propagation of Long-Distance H F. Signals," Electronic Radio Engr., vol. 36, no. 7, pp. 263-271; July 1959. ABSTRACT: Characteristics of high-frequency signals propagated between the United Kingdom and Japan are described. It was observed that, in winter and when the frequency in use is above the classical maximum usable frequency, signals of considerable intensity can be received along paths which deviate widely from the great-circle path while, at the same time, pulse signals are too weak to be received. On the other hand (especially in seasons other than winter), both pulse and continuous signals are received at good strength from directions close to the great-circle path during periods when the signal frequency exceeds the classical muf. Two propagation modes are postulated to explain these observations: one involves forward ground scattering from regions well off the great-circle path, and the other involves reflection by sporadic E-layer clouds appearing near the great-circle path. (a-3, b-2, c-1, d-5, e-0, f-Description)

4072. HERMAN, E., BERNELLA, D., ET AL., "Study and Investigation of Extremely High Altitude Ferret Reconnaissance Techniques," HRB-Singer, Incorporated, State College, Pennsylvania, Quarterly Report No. 6, Contract No. AF 33(616)5471, ASTIA No. AD-212 320L; 10 July 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4073. ANONYMOUS, "VHF Direction Finder," Western Development Laboratories, Philco Corporation, Palo Alto, California, WDL-Technical Report 1164. See also Department of Commerce PB153256; 15 July 1959. ABSTRACT: This report released for sale to the public 16 December 1960. The VHF D/F indicator maintained very good balance throughout the temperature range. No measureable phase shift was observed. The rather strange deflection observed on the internal meter at 40°F during the first run remains unexplained. No such deflection was observed on the external meter. At this temperature level there is a rather high degree of humidity due to condensation. A rerun was performed through the 40°F level and no deflection occurred. The indicator was checked after termination of the temperature test and normal functioning was observed. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

4074. HERMAN, J., "Further Extensions of Loop Antenna Theory," U.S. Army, Diamond Ordnance Fuze Laboratories, Tech. Report No. TR-756; 15 July 1959. ABSTRACT: A complete mathematical solution for the thin wire loop antenna, and the subsequent development of the principle of "mode selection and suppression" using inserted distributed and/or lumped internal impedances have been previously reported in DOFL Reports TR-462 and TR-600. The original solution was expressed in the form of wave families, consisting of one TE family and two TM families. In the present report, the two TM families are consolidated into one, and the general solutions for currents, impedances and fields revised accordingly. The solutions are then extended to incorporate the effect of multiple feed points with or without arbitrary phase delays. The problem of a loop with a solid dielectric core is then reformulated, and extended to the case of a hollow spherical dielectric core inclosing a spherical conducting core. It is shown that the basic loop element theory can be used to form the solution to an array of parallel, coaxial, unequally spaced, and unequal size loops, driven or parasitic. The results lead to a high degree of control over radiation coverage, and indicate further possible advantages, such as electronic beam scanning. The use of the theory developed can aid in antenna design to a great extent. The possibilities have not been completely explored. Further work will

probably prove quite profitable. (a-1, b-3, c-1, d-1, e-136, f-Theory and analysis)

4075. BROWN, A. K., "Abstracts of Articles on Irregularities and Horizontal Motions of Irregularities in the Ionospheric F-Region," Radio Propagation Laboratory, Stanford University, Technical Report No. 3; 20 July 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

4076. LIU, Y. J., AND CAMPBELL, J. O., "Collision Detection without Range Data," Electronics, vol. 32, no. 30, pp. 60-63; 24 July 1959. ABSTRACT: The "Anti-Collidor", herein described, is based on the principle that the relative velocity vector between two aircraft must coincide with the line of sight (L.O.S.) between them for a collision to occur. Relative velocity of two aircraft, equipped with this system, near enough to the same altitude to collide is computed, by analogue techniques, and the los is determined. The device gives a warning signal whenever the relative velocity vector is within a few degrees of the los. Basic operating principles and a block diagram are given. (a-3, b-2, c-1, d-1, e-0, f-Theoretical analysis)

4077. TRAVERS, D. N., AND MOORE, J., "Assembly of the Three-Loop Antenna and Investigation of Improved Methods for Reducing Reradiation Error," Southwest Research Institute, Report No. 18, Contract NObsr 64585; 26 July 1959. ABSTRACT: In this report, a description of the three-loop prototype antenna assembly is given, and a number of photographs showing components and subassemblies to be used in the antenna are presented. Preparation of the direction finder test site for the forthcoming demonstration includes the installation of a reradiator for bearing error tests. The bandwidth of the circuits following the video detector has been investigated as a function of pattern quality. It is shown that bandwidth limiting may be used to advantage in the prototype system. Bandwidth limiting may be accomplished by means of active low pass filters. A new method for reducing reradiation error by the introduction of stationary nulls is investigated theoretically. When reradiation is concentrated in one direction and a limited azimuth sector is scanned for bearing reception, a considerable improvement in accuracy over the coaxial spaced loop system is theoretically possible with the antenna described. A new approach to goniometer design is described which may ultimately lead to a means of increasing directivity without encountering the usual disadvantages associated with higher order multiloop antennas. Experiments to be performed during the next fiscal year are described. Design work on the automatic calibrator system is described with respect to modifications required to accommodate the three-loop prototype. (a-1, b-3, c-1, d-1, e-1000, f-Interim report. See Abstract No. 4039)

4078. BROWN, A. K., "Abstracts of Articles on Ground Backscatter Propagated by the Ionosphere," Radio Propagation Laboratory, Stanford University, Technical Report No. 4; 28 July 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Bibliography. See Abstract No. 4075)

4079. TRAVERS, D. N., "Investigation of Direction Finding Arrays for Use in the Earth-Air Interface," Southwest Research Institute, Proposal No. 6-260; 29 July 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-1000, f-Proposal)

4080. WHITE, K. L., "Investigation of Gabriel AT-781/U," Army Signal Missile Support Agency, White Sands Missile Range, New Mexico, AFC Report No. ANT-29-7-59. See also Department of Commerce PB143416; 29 July 1959. ABSTRACT: Results are presented on an investigation of the Gabriel Company, AT-781/U Antenna. The electromagnetic reception characteristics of the antenna for linearly polarized signals, i.e., horizontal, vertical, and ±45°, were determined in the azimuth plane for effective elevation angles of 0, 30, 60, 75 and 90°; elevation patterns were also made. The reception characteristics of the antenna were tested and patterns made at 409, 417, 440, 515 and 540 MCS. The VSWR of the antenna was less than 1.66 throughout the frequency range of 400 - 550 MCS. (a-3, b-3, c-1, d-1, e-0, f-Study)

4081. ELVEY, C. T., AND OWREN, L., "Fixed Frequency Backscatter Measurements - Alaska," Final Report IGY Project 6.28, NSF Grant No. Y/6.26/292, Geophysical Institute, University of Alaska, Alaska, p. 42; 31 July 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Propagation measurements)

4082. ANONYMOUS, "I.R.E. Standards on Navigation Aids: Direction Finder Measurements, 1959," Proc IRE, vol. 47, no 8, pp. 1349-1371; August 1959. ABSTRACT: Methods of measuring sensitivity, accuracy, interference, and signal fields associated with direction finding systems are prescribed; list of abbreviations and definition of terms; standard test conditions and equipment are described. IRE standard 59 IRE 12, S1. (a-3, b-1, c-1, d-1, e-0, f-Standards)

4083. HUMBY, A. M., "Equatorial Sunset Effect," Wireless Wld., vol. 65, no. 7-8, pp. 343-345; July-August 1959. ABSTRACT: Several examples are given of a propagation anomaly associated with communication links having terminals in equatorial areas. During years of high solar activity it has been found that for equinox months there is marked azimuthal scattering of signals for about two hours near local sunset at the equatorial terminal, making communication extremely difficult. It seems probable that this effect is related to the disintegration of the F2 layer observed at Singapore near local sunset during equinox months. (a-3, b-2, c-1, d-5, e-0, f-Propagation analysis)

4084. NORTON, K. A., "System Loss in Radio Wave Propagation," J. Res. Nat. Bur. Stand., vol. 63D, no. 1, p. 53; July-August 1959. ABSTRACT: A summary is presented of the ways in which the concept of system loss and the closely related concepts of transmission loss, basic transmission loss, propagation loss, and path antenna gain may be used for precise, yet simple, descriptions of some of the characteristics of radio wave propagation which are important in the design of radio systems. Definitions of various terms associated with the concept of system loss are given which introduce a greater flexibility into its use without any loss in precision. It is shown that the use of these added terms and concepts makes feasible the extension of the use of this method of description to any portion of the radio spectrum. A more general formula for the system loss is given which may be used for antennas with an arbitrarily small separation. Using this formula it is shown that the system loss between small electric or magnetic dipoles separated by a distance $d \ll \lambda$ can be made arbitrarily small even though the individual antennas have large circuit losses. Formulas are developed for the percentage of time that a desired signal is free of interference, and these are used to demonstrate methods for the efficient use of the spectrum. In particular, contrary to general belief, it is shown that efficiency is promoted by the use of high power and high antennas and, in the case of a broadcast service, sufficiently small separations so that there is appreciable mutual interference. An analysis is made of the variance of the path antenna gain in ionospheric scatter propagation. Methods are given for the calculation of the transmission loss for the ground wave and tropospheric scatter modes of propagation through a turbulent model atmosphere with an exponential gradient. Examples of such calculations are given which cover a wide range of frequencies and antenna heights. Finally, examples are given of the expected range of various tropospheric point-to-point scatter systems such as an FM multichannel teletype system, a television relay or an FM broadcast relay. (a-1, b-1, c-1, d-1, e-0, f-Theory analysis)

4085. RUTHROFF, C. L., "Some Broad-Band Transformers," Proc. IRE, vol. 47, no. 8, pp. 1337-1342; August 1959. ABSTRACT: Several transmission line transformers are described which have bandwidth ratios as high as 20,000:1 in the frequency range of a few tens of kilocycles to over a thousand megacycles. Experimental data are presented on both transformers and hybrid circuits. Typical applications are: interstage transformers for broad-band amplifiers; baluns for driving balanced antennas and broad-band oscilloscopes; and hybrids for use in pulse reflectometers, balanced modulators, etc. These transformers can be made quite small. Excellent transformers have been made using ferrite toroids having an outside diameter of 0.080 inch. (a-5, b-1, c-1, d-1, e-0, f-Description)

4086. DLUGATCH, I., "Optimizing Antenna Switches and Phases," Electronics, vol. 32, no. 33, pp. 55-57; 14 August 1959. ABSTRACT: It is not possible to fit a single omnidirectional aerial to an aircraft, but two aerials can be arranged which between them cover all directions. In order to avoid mutual interference when both are operated in parallel a switch may be used to select the stronger signal, or a phase-changer be used in order to bring the two signals into phase. An electronic control system for automatically achieving this adjustment is described. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

4087. ANDERSON, J. T., "Determination of the Orbit of an Artificial Satellite," Proc. IRE, vol. 47, no. 9, pp. 1658-1659; September 1959. ABSTRACT: The 4-section Doppler system proposed by Carrara, Checcacci and Ronchi is discussed. Theoretically such a system could lead to a complete solution of the orbit. However, in the case where neither the transmitting frequency nor the range at some part of

the orbit are known, the solution relies upon second-order differences between the data which, at the frequencies usually employed, are of the order of magnitude of the errors in the system. Iterative methods can be used, and the choice is often between the installation of a computer or a radar. An outline is given of several multi-station Doppler tracking systems. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

4088. BARRON, D. W., "The 'Waveguide Mode' Theory of Radio Wave Propagation When the Ionosphere Is Not Sharply Bounded," Phil. Mag., vol. 4, no. 45, pp. 1068-1081; September 1959. ABSTRACT: The propagation of radio waves to great distances can be treated by considering the space between the earth and the ionosphere as a waveguide and discussing the properties of the various waveguide modes. Previous authors have generally assumed that the upper boundary of the waveguide is a sharply bounded homogeneous ionosphere. The paper describes a method of calculating the mode characteristics for any horizontally stratified ionosphere in which the electron density and collision frequency vary with height in some arbitrary prescribed manner. The theory is given in full for a flat, perfectly conducting earth with no magnetic field, and its extension is outlined in an appendix. The paper presents the results of some calculations carried out on EDSAC 2, the automatic digital computer at the University Mathematical Laboratory, Cambridge. The effect on the waveguide modes of changing from a sharp to a gradual boundary on an otherwise homogeneous ionosphere is investigated by considering a variation of electron density (N) with height (z) according to the law

$$N = N_0[1 + \tanh \beta(z - h)]$$

using a range of values of β, and mode characteristics are also calculated for an ionosphere in which the electron density increases exponentially with increasing height. The effect on the waveguide modes of changes in the parameters of the exponential model, and the difference between the modes for vertical and horizontal polarization are described. (a-1, b-1, c-1, d-5, e-0, f-Theory)

4089. BROWN, G. H., "Pattern Synthesis - Simplified Methods of Array Design to Obtain a Desired Directive Pattern," R.C.A. Rev., vol. 20, no. 3, pp. 398-412; September 1959. ABSTRACT: Mathematical methods of determining the magnitude and phase of the current distribution over an extended linear aerial aperture in order to obtain a desired directive radiation pattern are described. It is shown that the radiation pattern and current distribution form a set of Fourier transforms, thus yielding a ready solution to the problem. By adding a pattern in an imaginary zone to the desired real pattern, many current distributions or array configurations are found, all of which give the same desired pattern in the real zone. (a-3, b-1, c-1, d-1, e-0, f-Antenna theory)

4090. CARR, J. W., "Broad-Band Radio Frequency Interferometer," Trans. IRE, vol. 1-8, no. 2, pp. 39-43; September 1959. ABSTRACT: In a steady-state monochromatic interferometer the interference pattern is scanned by the detector and the absolute wavelength thus determined. In the system described here the interference pattern sweeps past stationary detectors in a manner which is related to the change in frequency. Thus when the total net change in the phase of the interference pattern is measured with respect to a given absolute reference, an absolute measure of frequency can be obtained. The band being scanned is divided into an arbitrarily large number of unit cells determined by the required resolution. Pulse forming networks and logic circuits deliver the information in a manner readily adaptable to a binary counting system and substantially independent of the rate of change of rf frequency and signal amplitudes. (a-3, b-1, c-1, d-1, e-0, f-Description)

4091. CHRISTIANSEN, W. N., "Development of Highly Directive Aerials in Radio Astronomy," Proc. Instn. Radio Engrs., Australia, vol. 20, no. 9, pp. 519-526; September 1959. ABSTRACT: The design requirements for aerials to be used in radio astronomy, and the relationship between aerial size and beam-width are discussed. The amount by which an aerial can depart from its designed shape without serious deterioration in performance provides the upper limit in working frequency for most systems. The difficulty of maintaining a given shape increases rapidly with aerial size. An illustrated survey is given of the various types of radio astronomy aerial, and the special merits of each are explained. (a-3, b-1, c-1, d-11, e-0, f-Discussion)

4092. GRIERSON, J. K., "The Design Criteria of a Common Aerial System for Simultaneous Transmission and Reception of V.H.F. Signals," Electronic Engng., vol. 31, pp. 546-549; September 1959. ABSTRACT: A common aerial system that consists of five sections is described. The sections are a transmitter, a transmission coupling network, a receiver, a reception coupling network and an aerial. The transmission and reception coupling networks enable a single aerial to be used for transmission and reception of frequency-spaced signals without the necessity of time sharing. The coupling networks are considered in detail and practical values of components are assigned. (a-3, b-2, c-1, d-5, e-0, f-Description)

4093. GROGINSKY, H. L., "Position Estimation Using Only Multiple Simultaneous Range Measurements," Trans. IRE, vol. ANE-6, no. 3, pp. 178-187; September 1959. ABSTRACT: Three-dimensional generalized position-measurement systems are analysed. In these systems, target position is obtained by trilateration using only range data collected by a group of ν stations located in an arbitrary geometry. The method of maximum likelihood is used to obtain a joint estimator for the target coordinates which makes optimal use of the redundant data when the noise is Gaussian. A simple recursion formula for the estimator is obtained for this purpose and is shown to be convergent. This formula makes it possible to add data from a redundant number of stations at will and in proportion to their relative reliability. Further, it is shown that the recursion formula can be written entirely in terms of the changes in the successive iterative target position estimates. This technique offers a new means of obtaining tracking data on a moving target since it permits changes in target position to be computed directly as new data are obtained. The covariance matrix of the joint three-dimensional estimator is obtained in the case in which the measurement noise is small compared to the distances measured. The mean-square position error, namely, the trace of the covariance matrix, is shown to have a simple form for the general two-dimensional system in which the target and stations are coplanar. The geometry enters the variance expression only through the angles of cut θ_{ij}, which are the angles between the lines joining the target and the stations. The surveillance regions of various redundant two-dimensional systems obtained by using the joint estimator are compared to that obtained by using only pair-wise estimation. It is found that little improvement is made when the distance of the target to all the stations is much greater than the distance between stations. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4094. JOHNSON, C. M., "Bandwidth of Ferrite Phase Shifters for Phased Array and Direction-Finding Use," Proc. IRE, vol. 47, no. 9, p. 1665; September 1959. ABSTRACT: The use of a ferrite phase-shifter in a non-dispersive structure for broad-band operation in beam-steering applications is discussed. Measured phase-shift curves at 400 and 500 Mc/s are given and show good agreement with theoretical values. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4095. KAUVZOR, R., "Modern Radio Aids in Commercial Aircraft," Nachrichtentechnik, vol. 9, no. 9, pp. 415-418; September 1959. ABSTRACT: The problems of navigation and transmission of information are briefly reviewed with particular reference to increased speeds and flying altitudes of commercial aircraft and to traffic density. The operational requirements of equipments used in air-traffic control and satisfying the internationally agreed specification are considered. The discussion is limited to equipment used and manufactured in East Germany for medium-range aircraft. The use and limitations of precision-approach radar is treated in some detail. (a-3, b-2, c-4, d-4, e-9, f-Survey)

4096. MIYA, K., SASAKI, T., AND ISHIKAWA, M., "Angles of Arrival of a Very-High-Frequency Signal in Ionospheric Forward Propagation," Rep. Ionosphere Research, Japan, vol. 13, no. 3, pp. 187-195; September 1959. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Theory)

4097. WAECHTLER, M., "An All-Wave Cathode-Ray Direction Finder Using the Two-Channel Principle," Nachrichtentech. Z., vol. 12, no. 9, pp. 449-451; September 1959. ABSTRACT: Features of basic system common to all frequency bands and consisting of indicator unit, IF amplifier, monitoring unit and correcting networks for alignment of amplifier channels; interchangeable units containing special circuits for various frequency ranges; exchanging of units for frequency range changes can be avoided by additional remote control unit. (a-3, b-2, c-4, d-4, e-351, f-Description)

4098. GOLDSTEIN, M., "Antenna Control Group OA-( )/TRD," Belock Instrument Corporation, College Point, New York, Quarterly Progress Report No. 4, Contract No. DA 36-039-sc-78110, ASTIA No. AD-227 827; 1 September 1959. ABSTRACT: All of the units were completed and testing was begun. Servo motor and motor-generator units were received and had to be returned due to malfunctioning. Electronic circuit problems were encountered causing some delay.

Unit is now in final operational test. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 4041)

4099. LYONS, J. R., "Analyzing Multipath Delay in Communications Studies," Electronics, vol. 32, no. 36, pp. 52-55; 4 September 1959. ABSTRACT: Ionospheric conditions may be studied by analyzing the relative phase and amplitude of the multipath rf signals received in a communications link. Phase measurement is reduced to time measurement by pulse transmission and the two classes of signal expected are composite waveforms for pulses longer than the multipath delay time and discrete waveforms for pulses shorter than the delay time. Equipment is described which triggers at appreciable changes in the relative amplitude of the received wave-form and prints out the amplitudes and delay times between triggerings. The analyser capacity is limited to the measurement of four time intervals per pulse and the digital-recorder printing mechanism limits the sampling rate to five pulses per second. (a-3, b-2, c-1, d-1, e-0, f-Analysis)

4100. KELLUM, E. E., "The Development and Evaluation of a Panoramic Radio Direction Finding Receiver," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 14 on Contract No. 1834(02), ASTIA No. AD-228 194. See also Department of Commerce PB148599; 25 September 1959. ABSTRACT: A panoramic radio direction finding receiver is a device that enables an operator to determine the direction of arrival and frequency of any received signal over a specified bearing sector and frequency band. The purpose of this investigation is to determine the performance of the receiver when used for direction finding. Test results indicated that panoramic radio direction finding is not useful if only a Watson-Watt type of display is used. It is essential that a bearing converter be used; however, the bearing converter used in this test is not satisfactory because of the bearing spread. Methods to lessen the bearing spread are (1) decreasing the IF amplifier bandwidth in the receiver, (2) increasing the intermediate frequency in the bearing converter, and (3) triggering the timing pulse circuit only when the frequency in the bearing converter is the correct frequency. These methods are discussed in the experimental results. A block diagram and description of method (3) above is given. (a-3, b-3, c-1, d-1, e-0, f-Summary report)

4101. BJELLAND, B., HOLT, O., LANDMARK, B., AND LIED, F., "The D Region of the Ionosphere," Nature, vol. 184, pp. 973-974; 26 September 1959. ABSTRACT: At Kjeller near Oslo, measurements of ionospheric cross modulation were made in the period March 1957-May 1958, by means of the pulse technique introduced by Fejer. In this communication we shall present some typical results from these observations. (a-1, b-2, c-1, d-5, e-0, f-Measurement and observation)

4102. ALDRED, E. D., RIDDLE, M. M., AND BORMAN, B. L., "Design and Fabrication of Receiver, Radio R 902 ( )/PRD," Mallory, P. R., and Company, Indianapolis, Indiana, Quarterly Report No. 1, Contract No. DA 36-039-sc-78351, ASTIA No. AD-233 808; 30 September 1959. ABSTRACT: Preliminary design work done on Radio Receiver R-902 is described. This receiver is a portable, low battery drain equipment covering the 100-400 mc range. Design data and test results on breadboarded preselectors, local oscillators, and RF amplifiers for the RF tuner section of the receiver are discussed. Calculations and some tests results on narrow band, printed circuit, plug-in 30 mc IF amplifiers are also given. See also AD-234 417. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4103. ANDREWS, R. E., "Development of Manpack UHF Radio Receiver R-903( )/PRD," Microwave Engineering Labs., Palo Alto, California, Quarterly Progress Report No. 1, Contract DA 36-039-sc-78354; 30 September 1959. ABSTRACT: Research is concerned with developing a manpack radio receiver to cover the 400- to 1000-mc range, with capability of receiving AM, FM, CW and Pulse Modulations. It is a double conversion superheterodyne receiver with a passive preselector and crystal mixer front end. Physical requirements include, minimum weight, a compact package and capability of withstanding certain environmental conditions and tests. Emphasis is placed upon having the final equipment design reflect utmost simplicity, maximum reliability and easy maintainability. A summary of the technical requirements of the manpack UHF receiver is given with the proposed design outlined. The preliminary choice of a capacitively loaded coaxial cavity as the resonator for use in a double-tuned passive preselector is made. No battery tubes or transistors have been fully developed for operation in the desired local oscillator range so use of pencil triodes is to be weighed against sub-harmonic generation of the local oscillator signal with available battery tubes and transistors. Audio frequency modulation of the second oscillator is proposed as a means of achieving sensitive audio detection of CW signals when used in conjunction with the FM detector. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4104. BAILEY, A. D., DYSON, J. D., AND SYDNOR, R. L., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratories, ASTIA No. AD-231 364; 30 September 1959. ABSTRACT: See Abstract No. 4135. (a-4, b-3, c-1, d-1, e-282, f-Progress report)

4105. ANONYMOUS, "Electronic Reconnaissance," Martin Company, Baltimore, Maryland, Progress Report No. 36, Contract No. AF 33(604)14373, ASTIA No. AD-315 518; October 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4106. AGY, V., AND DAVIES, K., "Ionospheric Investigations Using the Sweep-Frequency Pulse Technique at Oblique Incidence," J. Res. Nat. Bur. Stand., vol. 63D, no. 2, pp. 151-174; September-October 1959. ABSTRACT: Describes the present state of oblique-incidence investigations of the ionosphere, using the sweep-frequency pulse technique, with special reference to the work carried out at the National Bureau of Standards. After a short review of the published literature, oblique-incidence sweeps are presented showing the diurnal and seasonal variations on two east-west paths of lengths 1150 km and 2370 km. The discrepancies between observed and calculated muf's are presented for both paths and then various phenomena of interest are shown. Finally, the above phenomena are discussed in the light of existing knowledge and theory and, in particular, it is shown that the discrepancies between observed and calculated muf's are unlikely to be caused by magneto-ionic deviation of the ray. (a-3, b-1, c-1, d-1, e-0, f-Description)

4107. BATES, R. H. T., "Random Errors in Aperture Distributions," Trans. IRE, vol. AP-7, no. 4, pp. 369-372; October 1959. ABSTRACT: The effects of random manufacturing errors on polar diagrams of aerials are analysed in terms of the radius of correlation and mean square magnitude of the errors. The basis of the method is the Wiener-Khintchine theorem. Approximate general formulae are given for the reduction in gain and lowest probable side-lobe level. The implications of the theory are discussed. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4108. BLASI, E. A., AND ELLIOTT, R. S., "Scanning Antenna Arrays of Discrete Elements," Trans. IRE, vol. AP-7, no. 4, pp. 435-436; October 1959. ABSTRACT: The input impedance of dipole elements which form part of a large plane array is shown to change greatly during the phase sweep of the scanning operation, and also to be extremely frequency-sensitive. The driving-point impedance tends towards a negative resistance value as a low-frequency cut is approached. It is suggested that the advantages that discrete-element arrays have through the ease of control of signal amplitude across the aperture are outweighed by the effects on the aerial gain of the impedance variations during scanning. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4109. BYATT, D. W. G., "The Marconi Automatic Plotter," Marconi Rev., vol. 22, pp. 215-224; Fourth Qtr., 1959. ABSTRACT: The plotter receives 25 c/s modulation from D/F stations, transmitted over land lines by a carrier method. After phase discrimination, pairs of voltages are available to produce square waves which are integrated to generate bearing traces on a crt. Up to six channels may be used and each trace may be offset to originate at a point corresponding to its D/F station. The traces are displayed sequentially via a gating circuit and may be solid or dotted to distinguish stations on two frequencies. (a-2, b-2, c-1, d-5, e-0, f-Description)

4110. CLARK, F. J., "Radar Beacons for I.R.B.M./I.C.B.M.," Trans. IRE, vol. MIL-3, no. 4, pp. 175-177; October 1959. ABSTRACT: Summarizes problems in the design of radar beacons and beacon aerials used in i.r.b.m. and i.c.b.m. test vehicles. The most important factors which affect compatibility between the beacon and tracking radars at the test range are enumerated. Design areas which should be correlated with the test range prior to finalisation of beacon criteria are also given. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

4111. CRUZAN, O. R., "Radiation Properties of Thin Wire Loop Embedded in Spherical Medium," Trans. IRE, vol. AP-7, no. 4, pp. 345-352; October 1959. ABSTRACT: Theory and properties of antenna that consists of sphere of homogeneous isotropic material with thin circular loop embedded just below surface in equatorial plane;

antenna driven by slice generator; formulas derived for current distribution, input impedance, input power, radiated power, power loss in spherical medium, and efficiency of antenna. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4112. DINTER, K., "Long-Distance Transmission of Angular Values of a Uniformly Rotating Wave. [Bearing Transmission of Radar Aerials]," Nachrichtentech. Z. (N.T.Z.), vol. 12, no. 10, pp. 491-496; October 1959. ABSTRACT: Information theory is used to determine minimum bandwidth requirements when only departures from the mean are transmitted. Measured results of such variations are reported. Mean value cannot be ignored in practice: a satisfactory method, needing only a small bandwidth extension, is the transmission of an angle reference pulse once per revolution. A practical installation is described. (a-3, b-2, c-4, d-4, e-0, f-Descriptive analysis)

4113. DYSON, J. D., "The Unidirectional Equiangular Spiral Antenna," Trans. IRE, vol. AP-7, no. 4, pp. 329-334; October 1959. ABSTRACT: Circularly polarized unidirectional radiation, over a bandwidth which is at the discretion of the designer, is obtainable with a single aerial constructed by wrapping balanced equiangular spiral arms on a conical surface. The non-planar structure retains the frequency-independent qualities of the planar models, and, in addition, provides a single-lobe radiation pattern off the apex of the cone. Practical aerials have been constructed with radiation patterns and input impedance essentially constant over the bandwidths greater than 12 to 1 and there is no reason to assume that these cannot be readily extended to more than 20 or 30 to 1. (a-3, b-1, c-1, d-1, e-0, f-Description)

4114. EBERT, W., EHLERS, H., AND DOBIASCH, R., "Review of the Present State of the Work of the European Broadcasting Union (E.B.U.) on the Ionospheric Propagation of Long and Medium Waves," Rdfunktech. Mitt., vol. 3, no. 5, pp. 205-218; October 1959. ABSTRACT: Since October, 1952, extensive series of measurements concerning the ionospheric propagation of long and medium waves have been carried out within the framework of a programme drawn up by the E.B.U., the object being to obtain well founded basic information for establishing a generally recognized night-time propagation curve or family of curves. The present state of this work is here reviewed. The measurement and evaluation methods are briefly described and the degree of accuracy to be expected is indicated. The results so far obtained from the statistical evaluation of the measurements relate to the statistical distribution of the instantaneous fieldstrengths in the course of a given recording hour, to the annual distribution of the hourly median values of the fieldstrength, as well as to the dependence of the fieldstrength on the sunspot cycle, on the geomagnetic latitude of the midpoint of the transmission path, on the frequency used and on the season of the year. The results presented are mainly based on recordings, each of 1 hour duration, made at fixed recording times (21.00 to 22.00 or 21.30 to 22.30 G.M.T.). Since other recordings have shown that the median fieldstrengths show large variations during the course of the night and that the maximum nocturnal fieldstrength is reached at a later hour than the fixed recording times so far used, longer recordings lasting the whole night, with 1/2 hour recording periods, have been carried out on an extensive basis since the beginning of 1959. The first results obtained from these all-night recordings are reported. A comparison is made between the E.B.U. provisional curves and some well known curves. The probable further course of the work of the E.B.U. is outlined. (a-3, b-2, c-4, d-4, e-0, f-Propagation theory)

4115. EHRENSPECK, H. W., AND POEHLER, H., "A New Method for Obtaining Maximum Gain from Yagi Antennas," Trans. IRE, vol. AP-7, no. 4, pp. 379-386; October 1959. ABSTRACT: In conventional Yagi design, optimum performance requires separate adjustments in a number of parameters; array length and height, diameter, and spacing of directors and reflectors. By introducing the notion of a surface wave travelling along the array, it is possible to demonstrate experimentally the interrelationship between these parameters. Gain then depends only on the phase velocity of the surface wave (which is a function of height, diameter, and spacing of directors) and on the choice of reflector. Thus, maximum gain for a given array length, for any director spacing less than 0.5λ, can be obtained by suitable variation of the parameters to yield the desired phase velocity. A design procedure that provides maximum gain for a given array length is presented. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4116. ELLYETT, C., AND WATTS, J. M., "Stratification in the Lower Ionosphere," J. Res. Nat. Bur. Stand., vol. 63D, no. 2, pp. 117-134; September-October 1959. ABSTRACT: A survey of the evidence for stratification in the ionosphere below 100 km is given, covering radio and optical observations, and rocket measurements. The conclusion is reached that one stratum at about 85 km is observed consistently, and that other fine structure exists but has no long-time constancy of height or pattern. There is no series of preferred heights below 100 km. Explanations are considered which may account for the observations, and the testing of radio methods of exploration in conjunction with rocket measurements is advocated in order to develop the most practicable means of obtaining accurate electron density v. height profiles on a synoptic basis. A bibliography of approximately 150 references is given. (a-3, b-1, c-1, d-1, e-0, f-Propagation - theory)

4117. GRINEVA, K. I., "Surface-Wave Aerial with a Tilting Beam," Radiotekhnika, vol. 14, no. 10, pp. 15-22; October 1959. ABSTRACT: The properties of a double surface-wave aerial are examined. The radiation pattern of the aerial is narrower than that of an ordinary aerial having the same dimensions, its direction can be varied by changing the phase of either of the aerial feeds. The amplitude of the beam tilt can be further increased by using tuned elements and by quadrupling the aerial. A double surface-wave aerial can also produce an equisignal region for possible applications in navigation. (a-3, b-2, c-2, d-2, e-0, f-Theory)

4118. HONEY, R. C., "A Flush-Mounted Leaky-Wave Antenna with Predictable Patterns," Trans. IRE, vol. AP-7, no. 4, pp. 320-329, October 1959. ABSTRACT: Describes the design and the measured performance of a large flat aerial consisting of an inductive grid spaced over a conducting surface. The analysis employs the transverse-resonance method to determine the radiating properties of the structure. This analytical technique is shown to predict very accurately the amplitude and phase of the illumination along the aperture. An aerial was built with an 18- by 24-inch aperture and tested over the frequency band from 7 to 13 kMc/s. The results of these tests confirm the theoretical predictions in every detail. A pencil-beam from the aerial scans in the H-plane (perpendicular to the aerial) from 20° to 60° from the normal to the aperture as the frequency changes from 7 to 13 kMc/s. The H-plane beamwidth remains virtually constant over most of this band. The first H-plane sidelobe or shoulder is at least 29 dB below the main lobe from 7 to 10 kMc/s, and at least 23 dB below from 10 to 13 kMc/s. All H-plane sidelobes beyond three or four beamwidths on either side of the main lobe are at least 40 dB below the main lobe everywhere in the 7 to 13 kMc/s band. At the design frequency the measured pattern agrees with the theoretical pattern within a fraction of a dB down to 40 kB below the peak of the main lobe, even though the gain of the aerial at this frequency is only 33 dB. (a-3, b-1, c-1, d-1, e-0, f-Description)

4119. HU, M. K., HU, Y. Y., "Successive Variational Approximations of Impedance Parameters in a Coupled Antenna System," Trans. IRE, vol. AP-7, no. 4, pp. 373-379; October 1959. ABSTRACT: A new variational formulation for a single impedance parameter of an m-aerial system is presented. This formulation enables one to determine any self impedance Z_{ii}, one at a time, merely by exciting aerial i alone and leaving all the other aerials open circuited. For determining any mutual impedance Z_{ij}, only two independent excitations, one the same as that used for determining Z_{ii} and the other for determining Z_{jj}, are required. Thus, if all the $m(m+1)/2$ impedances are required, only m independent excitation conditions are needed. In contrast to this, the formulation available in the literature is based on $m(m+1)/2$ independent excitation conditions. Because of a reduced number of excitation conditions and the way they are assumed, the physical nature of the problem is made simpler and easier to comprehend. Such comprehension helps considerably in the choice of trial current distributions for a specific application. Two methods of evaluating the successive higher-order approximations are also given. One is based upon an orthogonalized process, and the other is based upon the successive inversion of matrices. In the evaluation of a certain order approximation, both methods have the advantage of utilizing all the work already done for the lower-order approximations; and at the same time, additional work required is considerably reduced. It is believed that the formulation, as well as the two methods of successive approximations, will also be useful in other problems. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4120. JOLLIFFE, S. A. W., "Operational Applications of V.H.F. Direction Finders," Marconi Rev., vol. 22, pp. 199-214, Fourth Qtr.; 1959. ABSTRACT: Practical application of the modern ground-based vhf direction finder as an aid to aircraft navigation is considered. Factors limiting the accuracy are discussed and, where possible, systems are compared in terms of technical performance and capital and operating costs. (a-2, b-2, c-1, d-5, e-0, f-Discussion)

4121. JOLLIFFE, S. A. W., "Some Factors in the Design of V.H.F.

Automatic Direction Finders," Marconi Rev., vol. 22, pp. 168-198; Fourth Qtr., 1959. ABSTRACT: The reasons for direction finding in the vhf band and the need for automatic display of bearings are discussed. Basic systems are analysed and some of the more interesting design features of a preferred system are discussed in detail. The performance of a typical automatic direction finder is stated. (a-2, b-2, c-1, d-5, e-0, f-Discussion)

4122. SHARPLES, R. W., "Bearing Errors in Medium Frequency Automatic Direction Finders," Marconi Rev., vol. 22, pp. 225-233; Fourth Qtr., 1959. ABSTRACT: A number of causes of error in automatic direction finders caused by receiver circuitry and design are analysed. An automatic direction finding system is briefly discribed and errors inherent in its design discussed under two headings. The first type of error is that caused by motor torque being produced at the loop null position, when the loop should be at rest. Several different causes of spurious motor input are discussed, with particular attention to spurious coupling with the loop amplifier stage. Errors due to lack of sensitivity in the servo system are then analysed and the effect of loop input phasing is discussed. (a-2, b-2, c-1, d-5, e-0, f-Analysis)

4123. SHARPLES, R. W., "A Method of Providing Test Signals of Calculable Strength for Airborne Radio Direction Finders," Marconi Rev., vol. 22, pp. 234-239; Fourth Quarter, 1959. ABSTRACT: A method is described in which the loop antenna is placed in a magnetic field of known strength in a screened enclosure. Measurements are within ± 0.5 db of the calculated value. Practical results show that the enclosure may be reduced to a size suitable for portable use without loss of accuracy. (a-3, b-2, c-1, d-5, e-0, f-Description)

4124. STUTZ, S. L., "Personal Rescue Communication Equipment," Communication and Navigation Lab., WADC, Wright-Patterson Air Force Base, Ohio, WADC Technical Report No. 59-662, ASTIA No. AD-229 297; October 1959. ABSTRACT: The technical development is described of a long range alerting and identification communication facility AN/URC-33 and a companion personal direction finding (D/F) receiver AN/URR-40. The discussion begins with comments on the documentation orders initiating this project. The remaining discussion is confined to the technical aspects of the equipment developed and their resultant field capabilities. An accounting is included of the major contract actions and technical conclusions. The results of this project effort are: (1) technical feasibility; (2) a portable, low-powered communication facility; and (3) an only partially acceptable, hand-held D/F receiver, for personal use and field assembly. (a-1, b-3, c-1, d-1, e-0, f-Description)

4125. TAYLOR, W. L., AND JEAN, A. G., "Very-Low-Frequency Radiation Spectra of Lightning Discharges," J. Res. Nat. Bur. Stand., vol. 63D, no. 2, p. 199; September-October 1959. ABSTRACT: Spectral analyses are given of the groundwave portion of 33 sferic waveforms recorded from cloud-to-ground lightning discharges which occurred at distances ranging between about 150 and 600 kilometers from Boulder, Colo. Frequencies of peak energy lie between 5 and 20 kilocycles per second, which agree favorably with other published results. The average value of energy calculated from the groundwave pulses was found to be 26,600 joules, which is lower than values derived from other experiments. Various parameters, such as the peak amplitude and duration of the first half-cycle, are related to the radiated energy of the stroke. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4126. VASSY, E., "Long Distance Radio Navigation and Remote Control," Ann. Telecomm., vol. 14, nos. 9-10; September-October 1959. ABSTRACT: RANA navigation system, depending on phase relationships of signals received at one point from two fixed transmitters; signal phase is determined by phases and amplitudes of direct and ionospheric rays; system involves transmission of four frequencies from each transmitter. (a-3, b-2, c-3, d-3, e-0, f-Analysis)

4127. WAIT, J. R., AND CONDA, A. M., "Diffraction of Electromagnetic Waves by Smooth Obstacles for Grazing Angles," J. Res. Nat. Bur. Stand., vol. 63D, no. 2, p. 181; September-October 1959. ABSTRACT: The diffraction of electromagnetic waves by a convex cylindrical surface is considered. Attention is confined primarily to the region near the light-shadow boundary. The complex-integral representation for the field is utilized to obtain a correction to the Kirchhoff theory. Numerical results are presented which illustrate the influence of surface curvature and polarization on the diffraction pattern. Good agreement with the experimental results of Bachynski and Neugebauer is obtained. The effect of finite conductivity is also considered. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4128. HERRINCK, P., "Tides in the F2 Ionospheric Layer," Nature, vol. 184, pp. 1055-1056; 3 October 1959. ABSTRACT: D. G. Parkyn has shown how third and fourth harmonic tides could explain the peculiar behaviour of Satellites 1958 δ_1 and 1958 α respectively. A few weeks ago I noticed the existence of an 8-hr. tide in the half thickness $y_m = h_p - h'$ of the F_2 layer. Parkyn's paper has encouraged me to investigate this matter more thoroughly. (a-1, b-2, c-1, d-5, e-0, f-Observation report)

4129. ANONYMOUS, "Direction Finder Antenna System," American Electronic Labs., Inc., Philadelphia, Pa., Interim Development Report No. 3, Contract NObsr 77608, ASTIA No. AD-322 900L; 5 October 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4130. FREYMODSSON, B., "Receiving System Countermeasures," A.R.F. Products, Inc., River Forest, Ill., Interim Engineering Report No. 3, Contract NObsr 77636, ASTIA No. AD-323 349L; 9 October 1959. ABSTRACT: Preliminary design investigations for the search receiver, guard receiver and the indicator control unit were continued. Breadboard work for search and guard receivers was initiated. Specifications for saturable core reactors for the search and guard receivers were established. Design and fabrication of these saturable reactors was started. Specifications for procuring the IF crystal filters for the search and guard receivers were established. The design of temperature controlled ovens for the saturable core reactors for the search and guard receivers was continued. Breadboard work on the D/F system was carried into the final phase. (a-1, b-3, c-1, d-1, e-0, f-0)

4131. EDWARDS, L. C., HOOGASIAN, H., AND LINSDAY, D. E., "Ionospheric Propagation Studies. Final Scientific Report, Part 1, covering 15 June 1957 to 15 September 1959," ASTIA No. AD-233 734; 15 October 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Study report)

4132. ELLIS, G. R. A., AND CARTWRIGHT, D. G., "Directional Observations of Radio Noise from the Outer Atmosphere," Nature, vol. 184, pp. 1307-1308; 24 October 1959. ABSTRACT: Although many observations have been made in the past of the spectra of the radio emissions of the Earth's outer atmosphere in the frequency band 2-40 Kc/s it is only recently that a technique has been developed for continuously monitoring the occurrence of these phenomena. This has revealed that radio noise bursts lasting some hours are normally associated with disturbances of the geomagnetic field and follow many high-frequency radio outbursts from the sun. It seems likely that these very low frequency noise bursts are caused by the interaction between auroral streams of charged particles and the plasma of the outer atmosphere, and proposed mechanisms include Cerenkov radiation and gyro- or synchrotron radiation. Studies of their spectra, however, have not provided any clear-cut tests of these theories and it appears that additional information is required. Many bursts of very low frequency noise have a relatively narrow spectrum, usually about 2 kc/s wide and centred at about 5 kc/s. It is conceivable that these are caused by synchrotron radiation from particles at a distance of about 6 Earth radii where the geomagnetic gyro-frequency is about 5 Kc/s. In this case the radiation would be guided down the lines of force of the Earth's magnetic field and would enter the ionosphere at geomagnetic latitudes greater than 65°. Location of the geographical position of the entry point of very low frequency radiation into the ionosphere might therefore be expected to provide a test of the synchrotron hypothesis. This test would be possible if, after penetrating the ionosphere, the radiation spread horizontally in the ionosphere-Earth wave guide. The entry point would then act as a virtual source which could be located by normal direction-finding techniques. However, this picture may be incorrect, since it is possible that the radiation spreads horizontally within the ionosphere and only reaches the ground as an evanescent wave which would not provide useful directional information. Indeed, attempts in the past to locate the entry point of whistling atmospherics with direction finders have been unsuccessful. (a-1, b-2, c-1, d-5, e-0, f-Ionospheric study)

4133. KITCHEN, F. A., "Direction-Finding Observations on the 20 Mc/s Transmissions from the Artificial Earth Satellites," Proc. Roy. Soc., vol. 248A, no. 1252, pp. 63-68; 28 October 1959. ABSTRACT: Some direction finding, and associated radio observations on the artificial earth satellites are described. It is shown that it should be possible to derive the elements of the local track from a single observational sequence on a nearby transit. Samples of several bearing transits are presented and discussed in relation to possible ionospheric propagation modes. Reference is made to the occurrence of irregularities in bearing, signal strength and Doppler records,

which might yield data on the ionosphere if detailed orbit information becomes available. The possibility of investigating ionospheric wave propagation phenomena by making observations on the 20 Mc/s transmissions from the first Russian artificial earth satellite became apparent when it was appreciated that, up to some distance from the perigee, the satellite was moving near the maximum in the ionization density of the F-region. A wide-aperture direction-finder (Earp & Godfrey 1947), was used in the investigations, to exploit the improved performance over that of a conventional Adcock system predicted by Bain (1953, 1956). The operation of the system is equivalent electrically to the continuous rotation of a simple vertical dipole aerial around the circumference of a circle of about 7 wavelengths diameter at 20 Mc/s. This rotation imposes a phase modulation on the incident signal, the phase of which is used to derive the corresponding bearing information. In addition to a conventional visual display on a cathode-ray tube, a permanent record could be obtained of signal bearing, signal strength, time reference and calibration data on teledeltos paper. Observations of the elevation of the satellite could be made by measuring the total phase excursion across the array. (a-1, b-1, c-1, d-5, e-0, f-Description)

4134. TRAVERS, D. N., MOORE, J. D., DUBOIS, V. G., "Final Preshipboard Testing of the Three-Loop Direction Finding Antenna," Southwest Research Institute, Interim Report No. 19, Contract NObsr 64585, ASTIA No. AD-259 102; 26 October 1959. ABSTRACT: The completion, installation and testing of the prototype antenna is described prior to planning of a shipboard test. The antenna is now ready for such a test. This report has been prepared in detail with respect to the installation procedures followed during the performance testing of the three-loop prototype antenna. It is believed that this information will be of particular interest to personnel who may at some future date have an interest in the installation of small spaced loops and three-loop systems on shipboard like sites or those interested in testing associated with manufacture of such systems. It is recommended that personnel who may become involved in such work consider the applicable sections of this report in detail and if possible review the bibliographical references cited. Bearing tests of the prototype on the Southwest Research site indicate that equal to a simple loop D/F is obtained when no reradiator is present. Good performance of the antenna has been obtained throughout the range from 2.0 to 32.0 mc with installation on a 30-foot mast, and without making any adjustments of spaced loop parallelism or lead crossover balance beyond those made in the original assembly. A review of the calibration equipment design is made. (a-1, b-3, c-1, d-1, e-1000, f-Interim report. See Abstract No. 4077)

4135. BAILEY, A. D., DYSON, J. D., SYDNOR, R. L., HAYDEN, E. C., AND OTHERS, "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," First Quarterly Progress Report under U.S. Army Electronics Research and Development Laboratory (formerly U.S. Army Signal Corps Engineering Laboratories), Contract No. DA 36-039-sc-84525 and subsequent contracts including Contract No. DA 36-039-AMC-03720(E) and Contract No. DA 36-039-sc-87264, dated 30 October 1959 (subsequent reports in this series still being issued on 30 April 1964). ABSTRACT: The first of a series of reports continuing through at least 1964 on the subject of radio direction finding. Beginning with the earliest and continuing to the most recent, the following subjects have been covered: Adcock antennas, rotating spaced loops, Wullenweber systems, commutated antenna systems including Beverage antenna arrays, interferometer systems, VHF D/F antenna systems, data processing methods, panoramic radio direction finding, use of twin channel systems, interferometer calibration, propagation research including ray retracing, elevation of angle measurements, polarization measurements, spaced conical equiangular spiral antennas, phase comparison D/F systems, sum and difference phase meter units, site calibration procedures, measurement of vertical incidence ionograms, computer programs for use in radio location systems, statistical analyses and other related subjects. (a-4, b-3, c-1, d-1, e-282, 460, 508, 564, 587, 606, 620, 640, 726, 755, 777, 871, f-Work still in progress at the time of this writing)

4136. ELLIS, G. R. A., CARTWRIGHT, D. G., AND GROVES, J. R. V., "Spaced Observations of Radio Noise from the Outer Atmosphere," Nature, vol. 184, pp. 1391-1392; 31 October 1959. ABSTRACT: It has recently been suggested that during some types of radio noise storms generated in the Earth's outer atmosphere the source of the noise may remain almost constant in position in Right Ascension. If this were so, it would be expected that the arrival of the storm would be recorded at almost the same local time at places of different longitude, rather than simultaneously. To test this idea and more generally to investigate the extent to which observations of the noise are correlated at different places, recordings have been made during June and July 1959, at Camden N.S.W. (Latitude 34°03'S Longitude 150°42'E) and Adelaide (Latitude 34°56'S Longitude 138°53'E). The geomagnetic latitudes are 42°S and 45°S respectively. The noise level in a frequency band 1 kc/s wide centred at 4.5 kc/s war recorded using conventional techniques. It was found that, in the majority cases, noise bursts were recorded simultaneously at Camden and Adelaide. Of 18 bursts only 5 were recorded at Adelaide without being recorded at Camden and only 1 at Camden but not Adelaide. (a-1, b-2, c-1, d-5, e-0, f-Ionospheric-noise observation. See Abstract No. 4132)

4137. ANONYMOUS, "Electronic Reconnaissance System for Technical Intelligence. 'I' Channel. Volume I. Flight Test," Martin Company, Baltimore, Maryland, Final Report, vol. 1, Contract No. AF 33(604)14373, ASTIA No. AD-315 516; November 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4138. ANONYMOUS, "Electronic Reconnaissance System for Technical Intelligence. 'I' Channel. Volume II. Flight Test," Martin Company, Baltimore, Maryland, Final Report, vol. 2, Contract No. AF 33(604)14373, ASTIA No. AD-315 517; November 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4139. AGY, V., DAVIES, K., AND SALAMAN, R., "An Atlas of Oblique-Incidence Ionograms," NBS, Technical note no. 31; November 1959. ABSTRACT: This atlas is intended to serve a twofold purpose: first, to provide a compilation of records, of a type becoming standard in the field of ionospheric research, for those workers who are not now familiar with them, and second, to present records which are characteristic of the specific paths used by the National Bureau of Standards for consideration by those using other paths. (a-3, b-3, c-1, d-1, e-0, f-Propagation charts)

4140. BENOIT, R. C., JR., COUGHLIN, F., JR., AND KRASZEWSKI, S., "Design of a Quasi-Doppler UHF Direction Finder (Radio Direction Finder AN/GRD-11)," Rome Air Development Center, Griffiss Air Force Base, New York, RADC TR-59-106, ASTIA No. AD-232 936. See also Department of Commerce PB145841; November 1959. ABSTRACT: This report describes the design of Radio Direction Finder AN/GRD-11, a medium-aperture, quasi-Doppler direction finder operating in the frequency range of 225 to 399.9 mc. Contemporary techniques are compared to the quasi-Doppler technique, with respect to accuracy, reliability, susceptibility to site errors, and over-all system performance. The equipment developed is described and compared to existing direction finders. It is shown that the AN/GRD-11 provides a stable, fast-response bearing which is more reliable and more accurate than that obtained with contemporary, narrow-aperture, uhf D/F equipments. This new direction finder is not as susceptible to siting errors as existing equipments, and may be satisfactorily employed for air-traffic-control purposes at sites which were previously considered unsuitable. The characteristics of the AN/GRD-11 permit is employment in either fixed-base or tactical applications. (a-1, b-3, c-1, d-1, e-0, f-Description)

4141. JUNKER, W. E., "Design for the Dielectric Lens," Electronic Industr., vol. 18, no. 11, pp. 70-72; November 1959. ABSTRACT: The lens described is a short stepped polyrod to be used with a cylindrical waveguide primary feed. The preliminary design is carried out using cylinders of paraffin wax in place of the polythene or ptfe of the final model. First the length within the guide is adjusted, and then so is the taper on this internal section. These adjustments control the sidelobe level. The external disks are then adjusted, the one of diameter greater than the waveguide controls both sidelobe and beamwidth, the smaller ones only affect the beamwidth. A 2:1 frequency bandwidth can be obtained for a vswr > 2 with beamwidth varying only 25% at the 10 dB points and sidelobe level lower than 30 dB down. (a-3, b-2, c-1, d-1, e-0, f Description)

4142. PRESSEY, B. G., ASHWELL, G. E., AND ROBERTS, R., "Further Studies of the Deviation of Low- and Medium-Frequency Ground Waves at a Coast-Line," Proc. IEE, vol. 106B, p. 548; November 1959. ABSTRACT: The paper opens with a review of the theoretical studies of coastal deviation which have been made in recent years. It shows that there is close agreement between the various formulae derived for the deviation and that the graphical method used in an earlier paper by two of the present authors produces results which are substantially in agreement with those obtained from the formulae. In an endeavour to obtain experimental confirmation of the theoretical magnitude of the deviation and its variation with distance from the boundary with angle of incidence of the wave front at the boundary, etc., existing data from various sources have been examined. Two new series of measurement on low- and medium-frequency waves have also been made. In both cases the transmitters were located at sea and the

directional measurements taken at numerous sites on land. The general conclusion obtained from this experimental investigation was that a deviation due solely to the change in ground conductivity at the boundary and of the magnitude given by theory is small compared with the larger random directional errors which are attributed to ground irregularities, surface obstructions and other causes. The only systematic deviations observed had amplitudes of up to 7° and occurred within a few hundred metres (less than a half-wavelength) of the coast on the seaward side; at such near distances the theoretical formulae are not valid. It is concluded that for many coastal direction-finding stations coastal deviation as such is unimportant. (a-1, b-1, c-1, d-5, e-0, f-Study)

4143. KING, R. W. P., AND HARRISON, C. W., JR., "The Inverted L-Antenna: Current and Impedance," Sandia Corporation, Technical Memo No. 353-59(14); 2 November 1959. ABSTRACT: The distribution of current and the driving point impedance for an inverted L-antenna with image are obtained from the solution of the corresponding problems for the T-antenna. (a-1, b-3, c-1, d-1, e-401, f-Analysis)

4144. LEVINE, D., "Better Resolution Through PPI Shading," Electronic Indust., vol. 18, pp. 103-105; November 1959. ABSTRACT: Following an analysis of the average charge density in an annulus of the display for slant range and ground range radial scans, a simple RC circuit is described which reduces the over-bright centre. The circuit slows the rise of a range gate which is applied to the video amplifier. (a-3, b-2, c-1, d-1, e-0, f-Descriptive - analysis)

4145. STAFLUND, A. G., "Evaluation of UHF Commutated Antenna Direction Finding (CADF) Telecommunications Equipment," Central Experimental and Proving Establishment, Canada, CEPE Report No. 1426, ASTIA No. AD-240 756; November 1959. ABSTRACT: A comparative evaluation was made of the CADF and CRD6 direction finders. The purpose of these tests was to evaluate the CADF equipment operationally and technically and to compare its characteristics with those of the CRD6. Bearing response time, bearing fluctuation, bearing accuracy, effect of nearby obstructions on bearing accuracy, comparison of bearing characteristics obtained from modulated and unmodulated signals, cone of silence, and range capabilities of the CADF and CRD6 were determined. The CADF was concluded to be a much superior direction finder than the CRD6, and it is recommended that the CADF equipment be considered for any future ADF installations. (a-1, b-3, c-1, d-7, e-0, f-Evaluation report)

4146. ANONYMOUS, "Direction Finding Antenna System for Use with Countermeasures Receiving Set AN/WLR-1," American Electronic Labs., Inc., Philadelphia, Pa., Interim Development Report No. 4, Contract No. NObsr 77608, ASTIA No. AD-325 616; 5 November 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4147. FROMWILLER, L., "Sub Assembly Tester for Avionics Equipment," Hickok Electrical Instrument Company, Cleveland, Ohio, Quarterly Progress Report No. 4, Contract No. 36-039-sc-78122, ASTIA No. AD-230 812; 15 November 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test equipment)

4148. ANDREWS, R. E., "Development of Manpack UHF Radio Receiver R-903( )/PRD," Microwave Engineering Laboratories, Inc., Palo Alto, California, Quarterly Progress Report No. 2, Contract No. DA 36-039-sc-78354, Proj. 3-44-02-505, ASTIA No. AD-235 077; December 1959. ABSTRACT: Two resonators to cover the 380 to 1100 mc range for use in a low dissipation loss multi-tuned preselector are described. A capacitance plunger tuned model is found to have low unloaded Q and inadequate tuning range. A rotary-tuned coaxial resonator has the required tuning range and an unloaded Q of between 950 and 1550 over the band. A low battery consumption local oscillator is proposed using an efficient tuned varactor frequency tripler driven by a 7246 subminiature battery triode. A noise figure of 4.5 db is obtained for a 60 mc IF amplifier using triode-connected 6612 and 6611 subminiature battery tubes in a cascode input stage. Described is a bandwidth switching interstage for use in the second IF amplifier (4.3 mc) which contains a transitionally-coupled response for bandwidths of either 0.75 mc or 0.1 mc. The performance of a calibration generator proving calibration frequencies each 25 mc throughout the receiver band is presented. Power output levels between -49 dbm and -71 dbm are obtained. See also AD-231 456. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 4103)

4149. BAILEY, A. D., DYSON, J. D., AND SYDNOR, R. L., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory Report, ASTIA No. AD-233 755; December 1959. ABSTRACT: Progress report, see Abstract No. 4135 (a-4, b-3, c-1, d-1, e-282, f-Progress report)

4150. BEAN, B. R., AND CAHOON, B. A., "Effect of Atmospheric Horizontal Inhomogeneity upon Ray Tracing," J. Res. Nat. Bur. Stand., vol. 63D, no. 3, pp. 287-292; November-December 1959. ABSTRACT: The tracing of radio rays is normally carried out under the assumption that the refractive index varies only in the vertical direction. Although this assumption appears to be quite reasonable in the average or climatic sense, it is seldom satisfied under actual conditions and is strongly violated by horizontal airmass changes occurring near frontal and land-sea interfaces. This latter case is investigated by tracing rays through two instances of observed marked horizontal variation of the refractive index. The bending for these ray paths was then compared with values obtained under the normal assumption of horizontal homogeneity. Although at 1 kilometer and above these horizontal changes appear to have little effect, rays emitted at low elevation angles are sensitive to extreme horizontal variations of the atmosphere near the surface, such as those associated with ducting conditions. However, since it appears that such conditions occur less than 15 percent of the time at most locations, the majority of ray-path calculations may be carried out under the normal assumption of horizontal stratification of the refractive index. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4151. EHRENSPECK, H. W., AND KEARNS, W. J., "A Yagi-Adcock System for Satellite-Tracking," Air Force Cambridge Research Center, Bedford, Massachusetts, Report No. AFCRC TR 59-374, ASTIA No. AD-235 833. See also Department of Commerce PB149058; December 1959. ABSTRACT: Substitution of high-gain Yagi antennas for the dipoles usually in the Adcock direction-finding system provides much higher accuracy in satellite-tracking. Data obtained with the Yagi-Adcock system is less subject to the deleterious effects of fading, modulation of the signal, or tumbling of the satellite. The resulting advantages of this system over more complicated ones such as those based on doppler shift techniques and the use of interferometers are an increased signal-to-noise ratio and multiple angular bearings. The high accuracy of the system was successfully demonstrated during the third United States Lunar probe (November 8, 1958). Measurements taken on a full-scale 108-Mcps Yagi-Adcock agreed within 0.5° of those reported by Project SPACETRACK. The design procedure and scaled dimensions for this system are given. Also described is a signal enhancement circuit that enables the signal detection level to be increased by a factor of 2 above the ambient noise of the receiver. (a-1, b-3, c-1, d-1, e-0, f-Description)

4152. HALLEY, P., "Theoretical Study of Some Lozenge or Rectangular Antennas for Vertical Ionospheric Sounding," Ann. Telecomm., vol. 14, nos. 11-12; November-December 1959. ABSTRACT: Curves of directivity vs ratio of conductor length to wavelength for rhombic antenna with vertical short diagonal, for various lozenge angles, analysis of rectangular antenna situated in vertical plane with its long side horizontal. (a-3, b-1, c-3, d-3, e-0, f-Analysis)

4153. MADDEN, R., "The Indeterminancy of Measurements Performed by Radar Equipment," Trans. IRE, vol. ANE-6, no. 4, pp. 219-220; December 1959. ABSTRACT: A theoretical derivation of the indeterminacies of simultaneous position and velocity measurements of a reflector when using reflected electromagnetic waves is given. It is shown that the product of the indeterminacies is given by $1/(8\pi)/\lambda_s c$ where λ_s is the illuminating wavelength and c the speed of light. It is shown that the necessary consequence of nonsimultaneous measurements is an uncertainty as to whether the measurements are common to the same reflector. If this uncertainty is to be overcome, the reflectors must be spaced at a distance $1/2c\Delta T$ where ΔT is the time separation of the position and velocity measurement. (a-1, b-1, c-1, d-1, e-442, f-Theory)

4154. PAVLOV, YU. V., "Theory of Radio Thermal Direction Finder with Conical Scanning," Radiotekhnika, vol. 14, no. 12, pp. 50-57; December 1959. ABSTRACT: Expressions for maximum and angular sensitivity of such modulation-type direction finder; formula for equivalent temperature of antenna which is true for thermal direction finder with any noise factor including quantum noise. (a-3, b-2, c-2, d-2, e-0, f-Theory)

4155. PRASAD, S., "Corner-Driven Square-Loop Antennas," Canad. J. Phys., vol. 37, pp. 1407-1417; December 1959. ABSTRACT: Theory for two identical square loop antennas driven in zeroth phase

sequence and second phase sequence; equations are solved individually by method of iteration and first order formulas obtained for current distributions and driving point impedances; for each phase sequence, sum of symmetrical and antisymmetrical impedances gives self impedance and difference gives mutual impedance. (a-3, b-1, c-1, d-7, e-0, f-Theoretical analysis)

4156. TSUNODA, K., "New Type of Watson-Watt Direction Finder Simplified by Applying Automatic Control," J. Inst. Elect. Commun. Engrs, Japan, vol. 42, no. 12, pp. 1175-1180; December 1959. ABSTRACT: In the ordinary type of Watson-Watt direction finder, it is difficult to obtain the required balance of gain and phase versus frequency in the pair of receivers. In the new type, an oscillator is used which differs slightly in frequency from that of the signal but has an amplitude greater than the signal amplitude. The outputs applied to the deflecting plates of the cro are the respective beats of the oscillator output with the two signal components, so that the phase difference is nearly zero. The afc and agc of the receivers are also operated by the oscillator output and accordingly the required gain balance can be obtained. Block diagrams show the arrangements used. Typical sense and bearing indications are illustrated that were obtained with equipment using a pair of superheterodyne receivers, without rf amplifiers, in the frequency range 1.4 to 3.5 Mc/s, with a cross loop antenna 1.2 m in diameter. For a signal strength of 100 μV/m, the tolerance over the whole reading range was ±0.5° and the minimum field strength required for measurement was 2μV/m. (a-3, b-1, c-6, d-6, e-0, f-Theory and experiment)

4157. ANONYMOUS, "Direction Finding Antenna System," American Electronics Labs., Inc., Philadelphia, Pa., Interim Development Report No. 5, Contract No. NObsr 77608, ASTIA No. AD-322 901L; 5 December 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4129)

4158. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures, VLF," A.R.F. Products, Inc., River Forest, Illinois, Interim Report No. 5, Contract No. NObsr-77636, ASTIA No. AD-312 033; 7 December 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4159. WYMER, F. J., "Bearing Averaging Using Two or More Spinning Goniometer RDF Systems," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 15 on Contracts Nonr 1834(02) and DA 36-039-sc-74898, ASTIA No. AD-231 860. See also Department of Commerce PB152131; 24 December 1959. ABSTRACT: By using two or more Adcock Antenna arrays, and averaging the indications from each one, an "instantaneous" average bearing can be obtained. The equipment used in this investigation was designed to perform the algebraic manipulations determining the bearing indication, and was used to show the validity of the analysis. It was tested in the laboratory using two channels to represent two RDF systems. The problem, then, was to develop equipment which would average the bearing indications from two Adcock antenna arrays. The purpose was to show that this system could be used to reduce the errors in bearing indications due to interfering components at the carrier frequency. The development of an optimum distribution of arrays was also desired, and for this purpose, the effects of various parameters on the averaged bearing indication was desirable. (a-1, b-3, c-1, d-1, e-0, f-Experimental development report - thesis paper)

4160. KUECKEN, J. A., "How Solar Noise Calibrates Radars," Electronics, vol. 32, no. 52, pp. 44-45; 25 December 1959. ABSTRACT: Describes a method of checking aerial bearing by an optical sighting of the sun combined with the simultaneous measurement of solar noise. (a-3, b-2, c-1, d-1, e-0, f-Description)

4161. STALDER, J. J., "Improved Airborne Direction Finder," New York University College of Engineering, New York, Final Report, Contract No. DA 36-039-sc-75074, ASTIA No. AD-229 914; 29 December 1959. ABSTRACT: Efforts were made to evaluate the performance characteristics of airborne direction finders employing modulation identification procedures at audio frequency. The loop antenna's drive signal was derived from identifying modulation impressed upon the "desired" transmission. Three circuits employing audio coherent detection and limited range automatic phase control loops were evaluated. Two circuits employing audio band pass filtering followed by envelope detection were also evaluated. It was shown that the non-coherent, as well as the coherent, audio identifying circuits were capable of providing proper ADF performance in the absence of interference. Both circuit types were capable of reducing the interference induced bearing errors which would result with the conventional ADF circuits. The non-coherent circuits performed somewhat better than the coherent circuits, although they were not generally capable of reducing interference errors to an acceptable level. It was concluded that envelope detection, employed prior to derivation of identified loop drive signals, is not a satisfactory basis for elimination of the major bearing errors due to interference. (a-1, b-3, c-1, d-1, e-0, f-Final report - project. See Abstract No. 4011)

4162. EGAN, R. D., "Anisotropic Field-Aligned Ionization Irregularities within the Ionosphere near the Magnetic Equator," Stanford University, Radio Propagation Laboratory, Technical Report No. 1, National Science Foundation Grant No. Y-22-10/309, 30 December 1959. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Propagation study report)

4163. ALDRED, EL D., RIDDLE, M. M., ET AL., "Design and Fabrication of Receiver, Radio R-902(XE-1)/PRD," Mallory, P. R., and Company, Indianapolis, Indiana, Quarterly Report No. 2, Contract No. DA 36-039-sc-78351, ASTIA No. AD-234 417; 31 December 1959. ABSTRACT: Design work and test results on breadboarded circuits for Radio Receiver R-902 are described. This receiver is a portable, low battery drain equipment covering the 100-400 mcs range. Design considerations, test results and problems encountered concerning the preselector, local oscillator, and RF amplifier for the RF tuner section of the R-902 Receiver are discussed. Test results and problem areas concerning the IF amplifier, AVC, audio stages, crystal calibrate oscillator and harmonic generator, and discriminator are discussed. The design consideration and configuration for the case, battery compartment, front panel, dial mechanism, and crystal filter switching, are shown. (a-1, b-3, c-1, d-1, e-0, f-Descriptive report. See Abstract No. 4102)

1960

4164. ANONYMOUS, "Antenna Techniques and Devices," Air Force Cambridge Research Laboratories, Bedford, Massachusetts, Report No. AFCRL TN 60-1173, ASTIA No. AD-252 539L; 1960. ABSTRACT: A 21 page report including illustrations which includes information regarding Direction Finding and antenna patterns. (a-4, b-3, c-1, d-1, e-0, f-Description)

4165. BAIN, W. C., AND GOLTON, E., "Some Effects of the Ionosphere on Signals from Earth Satellites," Space Research, Amsterdam, Netherlands, North-Holland Publishing House; 1960. ABSTRACT: Not available. (a-4, b-6, c-8, d-12, e-0, f-0)

4166. BOWHILL, S. A., "The Distribution of the Fade Lengths of a Randomly Fading Radio Signal," Statistical Methods in Wave Propagation, New York, Pergamon Press, pp. 220-226; 1960. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Statistics on ionospheric research)

4167. BRACEWELL, R. N., "Antenna Tolerance Theory," Statistical Methods in Wave Propagation, New York, Pergamon Press, pp. 179-183; 1960. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Theory)

4168. BRUNDELL, P. O., "Current and Potential Distribution on a Circular Loop Antenna," K. Tekn. Hoegsk. Handl., vol. 154; 1960. ABSTRACT: The current and potential distribution on a circular loop antenna is investigated. Following Hallen's Theory, special reference is made to their travelling-wave character. (a-3, b-1, c-8, d-17, e-0, f-Theoretical analysis)

4169. BROOKNER, E., AND FLINK, J., "Coherent Enhancer for Pulse Radar Applications," IRE Int. Conv. Record, vol. 8, pt. 8, pp. 240-253; 1960. ABSTRACT: A practical means is presented whereby range extension, velocity information, increased accuracy, clutter rejection, and increased invulnerability to jamming are obtained. This is done by techniques which are compatible with existing radars. The methods are applicable to continuous-scanning, step-scan and tracking radars. The improved characteristics are obtained without increased power. The improvement involves the implementation of a practical matched filter system. The implementation of the exact ideal matched filter for pulsed radars requires a large number of delay lines which makes it costly and impractical. This problem is circumvented by using an approximate matched filter. It consists of a single delay line in a closed-loop system. The data processing is performed at inter

mediate frequencies. The problem of preventing the centre frequency of the matched filter from sliding relative to the signal frequency to be detected is solved by providing a calibrating signal. To accommodate the whole band of Doppler frequencies, a bank of filters covering the whole spectrum of possible signal frequencies is multiplexed within a single delay-line loop. Although the filter is only approximate, its results are nearly optimum. The signal-to-noise enhancement for the approximate filter is only 1.2 dB below that of the ideal matched filter. Some consideration is also given to a two-delay-line matched filter. For a two-delay-line system the enhancement is only 0.7 dB below that of the exact matched filter. (a-3, b-1, c-1, d-1, e-0, f-Description)

4170. BUCHHOLZ, H., "Electromagnetic Fields with Axial Symmetry, Bounded by Cone and Sphere," Arch. Elektrotech., vol. 45, no. 1, pp. 27-48; 1960. ABSTRACT: Continuing his previous work, Ann. Phys. (Leipzig), Folge 2, vol. 6, 185-210 (1948), the author obtains formulae for the field due to a hypothetical magnetic current ring, with various boundary conditions, to assist in calculating the radiation field from certain types of aerial. (a-3, b-2, c-4, d-4, e-0, f-Theory)

4171. CHERNOV, L. A., Wave Propagation in a Random Medium, New York, McGraw-Hill Book Company, Inc.; 1960. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Reference book; translation from Russian)

4172. DESIRANT, M., AND MICHIELS, J. L., "Electromagnetic Wave Propagation," Proceedings of an International Conference, Postal and Telecommunications Group of the Brussels Universal Exhibition, 1958, New York, Academic Press; 1960. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-Propagation theory)

4173. DIEMINGER, W., "Ground Scatter by Ionospheric Radar," Avionics Research Papers, AGARD Avionics Panel Meeting, Copenhagen; October 1958; New York, Pergamon Press, pp. 29-43; 1960. ABSTRACT: Not available. (a-4, b-1, c-8, d-20, e-0, f-0)

4174. EGIDI, C., "Artificial Aerials for Measurements on Metre Wavelength Receivers," Tech. Mitt. P.T.T., vol. 38, no. 3, pp. 66-101; 1960. ABSTRACT: To meet various possible schemes of connections, formulae are developed and numerical tables provided to enable the component values of artificial aerials to be calculated. These aerials are intended to apply to one or more standard signal generators and test receivers so as to ensure correct impedance matching for each system of connection. The particular cases considered are of a signal generator with unbalanced output-impedance connected to a receiver with unbalanced input-impedance and that of a balanced output-impedance signal-generator to an unbalanced receiver input impedance. A further development is the case of two signal generators with unbalance output connected to either a balanced or an unbalanced receiver-input. Two variables are considered in the first case, that when the output impedances of the signal generators are equal and that when they are not. Solutions are given for the latter case using combinations of artificial aerials. Finally the general case of multiple artificial aerials for two or more generators is dealt with and general formulae are developed. Tables giving resistance values for all cases of practical interest were calculated and correspond to normalized values of signal-generator and receiver output- and input-impedances respectively. (a-3, b-1, c-3 and 9, d-13, e-0, f-Theory)

4175. HANSFORD, R. F., (Editor), Radio Aids to Civil Aviation, London, Heywood and Company, Ltd.; 1960. ABSTRACT: References to articles and papers presented during 1956 and 1957; many authors. (a-4, b-6, c-1, d-5, e-0, f-Miscellaneous papers pertaining to radio aid to aviation)

4176. HUTTLY, N. A., "Use of Tetrachoric Cross-Correlation in Hypotheses Concerning Auto-Correlated Fading Signals," Statistical Methods in Radio Wave Propagation, New York, Pergamon Press, pp. 154-175; 1960. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Reference text)

4177. JONES, J. P., TAYLOR, P. E., AND MORROW, C. W., "Design Techniques for a Light Weight High Power Spiral Antenna," IRE WESCON Convention Record, vol 4, pt 1, pp. 107-22; 1960. ABSTRACT: The operation of a spiral aerial is described in terms of the current band theory. A form of two-start Archimedian spiral wound from copper tube was embedded in various dielectric materials. The best power handling capacity was achieved for a combination of glass-loaded teflon near the feed point with a foamed dielectric for the outer parts. Information is given about the matching devices, cavities and radomes used together with the achieved radiation patterns and v.s.w.r. plots. A bibliography of papers published on spiral aerials in U.S. in included. (a-3, b-1, c-1, d-1, e-0, f-Description)

4178. KUECKEN, J. A., AND PFIZENMAYER, H. L., "A Low Side-lobe Interferometer Antenna," IRE WESCON Convention Record, vol. 4, pt. 1, pp. 95-106; 1960. ABSTRACT: An investigation into a series of interferometer aperture distributions is presented. Calculated and measured patterns for small 8-element and large 36- and 60-element arrays are shown with the effects of distribution shape discussed. Some distributions capable of producing interferometer patterns with sidelobes below -20 dB are described. (a-3, b-1, c-1, d-1, e-0, f-Study and discussion)

4179. LUX, P. A., SWARM, H. M., AND MCNELIS, D. D., "Determination of the Optimum Antenna Pattern for a Signal Burst Communication System," IRE WESCON Convention Record, vol. 4, pt. 7, pp. 17-26; 1960. ABSTRACT: Deals with finding the optimum directivity pattern of an aerial which is used as part of a communication system. Due to irregularities in the atmosphere, ionosphere, or meteor trails, a signal does not arrive at the receiving aerial from one direction only. Therefore the highest possible gain aerial with its narrow beamwidth is not always optimum for point-to-point communications. It is found that the optimum directivity pattern is determined by the probability distribution of the angle of arriving signal, the attenuation of the signal by the propagating medium, and the receiving criteria. Only single-path propagation is assumed at any instant. The results are most readily adaptable to a meteor-burst communication system, but extensions to other single-path propagation systems should not be too difficult. (a-3, b-1, c-1, d-1, e-1, f-Analysis)

4180. MACDONALD, F. C., AND SHAPIRO, A., "Statistical Analysis Equipment for Propagation Research," Statistical Methods in Wave Propagation, New York, Pergamon Press, pp. 311-318; 1960. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Reference text)

4181. MARSHALL, W. H., "Development and Use of Short Wave Radio Transmitters to Trace Animal Movements," Progr. Rept. to Natl. Sci. Foundation, University of Minnesota; 1960. ABSTRACT: Not available. (a-4, b-9, c-1, d-1, e-0, f-Biotelemetry)

4182. MEYER, E., AND SCHNUPP, P., "Model Experiments on Electromagnetic Reflected Beam Direction Finding (Radar) Using Ultrasonic Waves (Sonar)," Acustica, vol. 10, no. 1, 1-13; 1960. ABSTRACT: The following results were obtained from model experiments for radar camouflage using ultrasonic waves (sonar) of 2.5 mm wavelength: The radar screen picture is essentially composed of signals reflected optically from plane surfaces and of scatter signals from edges. The level of the scatter signals from edges was at least 30 dB below that of an optical reflection. The scattered wave from an edge is only slightly changed when the adjoining surface is covered with absorbers. In order to lower the level of scatter signals from edges by about 10 to 20 dB down to the noise level it is sufficient to tooth the edges over a distance equal to several wavelengths. Screen pictures of model villages are given. Measurements of the back scattering of spheres, cylinders and circular disks of various cross-sectional areas were used for calibrating the apparatus. (a-3, b-2, c-4, d-4, e-0, f-Experimental report)

4183. MIDDLETON, D., An Introduction to Statistical Theory, New York, McGraw-Hill Book Company; 1960. ABSTRACT: Not available. (a-4, b-6, c-1, d-1, e-0, f-Reference text)

4184. NEFF, H. P., AND TILLMAN, J. D., "An Electronically Scanned Circular Antenna Array," IRE Internat. Convention Record, vol. 8, pt. 1, pp. 41-47; 1960. ABSTRACT: A curcular array is described which has the following characteristics: (1) any azimuthal pattern can be obtained which can be represented by a truncated Fourier series; (2) the main beam can be pointed to any azimuth angle; (3) the phase of the current in each element and the terminal impedance of each element does not depend on the direction of pointing. These characteristics make it possible to connect amplifiers to each element and to control the direction of pointing by varying only the magnitude of the amplifier output. The design of an array of this type and of the required amplifiers is described, and experimental confirmation is presented. (a-3, b-1, c-1, d-1, e-0, f-Description)

4185. NIKITIN, Ye P., AND SAIBEL, A. G., "Dynamic Properties of Automatic Pulse Range-Finders with Two Integrators," Radio Engineering, vol. 15, no. 3, pp. 33-41; 1960. ABSTRACT: Formulas and graphs for determination of stability and transient behavior of automatic range tracking systems used in radar and radio navigation; calculation of systematic dynamic errors. (a-3, b-2, c-1, d-2, e-0, f-Translation from Radiotekhnika)

4186. PASNAK, M., AND LUNDSTEN, R., "Effects of Ultrahigh Temperature on Magnetic Properties of Core Materials," Trans. Amer. Inst. Elect. Engrs. I, vol. 78, pp. 1033-1039; 1960. See also Commun. and Electronics, no. 46; January 1960. ABSTRACT: An experimental study was made of the effects of temperature on the magnetic properties of the following ferromagnetic alloys: Orthonol, 4-79 Mo Permalloy, AEM 4750, L and Z Silectron, Transformer A, Audio Transformer A, 11.7 Alfenol, 15.5 Alfenol, 3 Mo Thermenol, 7-70 Perminvar, and Supermendur. Measurements were made of the d.c. and 60 c/s magnetic properties in the temperature range of 24-800°C. The materials were also evaluated after several temperature cycles between 24-500°C. The results indicate that, in general, high temperature decreased the maximum induction and the residual induction from their 24°C values. For all materials tested, with the exception of Supermendur and 11.7 Alfenol, the coercive force decreased with increase in temperature. The maximum permeability increased with increasing temperature until the Curie temperature was approached, then it started to decrease. The initial permeability also increased with increasing temperature, but unlike the maximum permeability, it generally started to decrease at a greater rate and at a lower temperature. Grain-oriented materials were more affected by temperature cycling than were unoriented materials. The effects of temperature cycling on the magnetic properties generally appeared as an increase in the coercive force, a decrease in the maximum permeability, a decrease in the residual flux density, and a decrease in the squareness ratio. (a-3, b-1, c-1, d-1, e-0, f-Study)

4187. PHILLIPS, C. C., "New Approach to Antenna Beam-Shaping-'Coke-Bottle' Antenna," IRE WESCON Convention Record, vol. 4, part 1, pp. 74-82; 1960. ABSTRACT: Method of vertical plane-beam-shaping from Wullenweber 3-dimensional array is presented; method consists of expanding desired pattern in Fourier series expansion and relating parameters in expansion to parameters in Wullenweber array. (a-3, b-1, c-1, d-1, e-0, f-Wullenweber methods)

4188. SHELTON, P., "Application of Frequency Scan to Circular Arrays," IRE WESCON Convention Record, vol. 4, part 1, pp. 83-94; 1960. ABSTRACT: The problem of obtaining focusing from a circular array together with 360 degree scanning by frequency variation is considered. It is shown that uniform variation of the line length between elements of a tapped serpentine transmission line allows good focusing from a circular array. The radiating aperture is limited to the appropriate sector of the circle by using filters in the coupling junctions between the serpentine line and the radiating elements. The relation between bandwidth and transmission-line folding factor is determined, and limitations imposed by element coupling, element spacing, and overlapping apertures at the band edges are found. Accuracy of focus is determined as a fourth-power function of aperture size relative to diameter. Aperture amplitude distribution is related to the filter characteristics and efficiency of coupling. The design of directional filters for partial coupling is described, and the effect of the transfer phase characteristic is calculated. Performance is estimated for a sample design covering the frequency range 2 to 4 Gc/s with a six-foot-diameter array of 100 elements. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4189. SINGH, B. N., AND SIMHA, O. P., "The Variation of the Rate of Fading with Frequency," J. Atmos. Terrest. Phys., vol. 19, pp. 141-143; 1960. ABSTRACT: As early as 1932, Appleton had observed that the intensity fluctuations of the downcoming radio waves exhibit a kind of periodicity which is roughly proportional to their frequency. He also found that if T is the period of the fluctuations and λ the wave-length, T/λ increases monotonically with distance. During later years a number of workers (Pawsey, 1935; Harwood, 1951; Bowhill, 1953; King, 1958) have determined the periodicity of fluctuations, i.e., the fading speed for a wide range of frequencies with different angles of incidence. King (1958) has shown that if the night-time rate of fading is plotted against the frequency of radio signal multiplied by the cosine of the angle of incidence then the points are found to be scattered about a straight line represented by the equation:

$$\text{fading speed} = 0.30 \times f \cos i \text{ max./hr}$$

where f is the frequency in kc/s, and i is the angle of incidence on the ionosphere. The frequencies considered by King were up to 2000 kc/s and only two of them were for reflections from the F-region. The present authors have determined in their laboratory the night-time fading speed of radio signals transmitted from AIR, Delhi, in the frequency region 9605-17,783 kc/s. The values are given and are the mean of a large number of observations taken between 2300 and 0215 hours IST during different parts of the year. All the observations were for reflections from the F2-region. In calculating the values of cos i the height of the F2-region was assumed to be 300 km which was the mean of the values recorded over Calcutta and Delhi during the periods of observation, and the curvature of the earth was allowed for. The value of cos i thus calculated was 0.598. (a-1, b-1, c-1, d-5, e-0, f-Theory based on observations)

4190. STEINER, F., AND STITTGEN, H., "The Reduction of Wave Interference Bearing Errors by the Use of Large-Base Systems," National Research Council of Canada, Technical Translation No. 901; 1960. From NTZ, vol. 11, no. 8, pp. 417-423; 1958. ABSTRACT: The phase conditions in the field of a plane, vertically and linearly polarized electromagnetic wave horizontally incident are characterized by the fact that the lines of equal phase in any given horizontal plane are straight lines perpendicular to the direction of propagation. This is the basis of direction finding both in the Adcock and the Doppler instruments. In the former, the voltage difference between two dipoles is the criterion of the bearing. It vanishes when both dipoles lie on the same line of constant phase, and the normal of the line joining the two dipoles then points in (or away from) the direction of incidence. In the Doppler direction finder a virtual motion of a dipole along a circular path is produced by scanning many dipoles arranged in a circle. In this manner a frequency modulation (variable Doppler displacement of the frequency) arises which, as will be shown below, depends on the direction and gives the bearing information. If an additional, coherent, weaker wave is produced by reflection, then the phase field is altered in such a way that the lines of equal phase oscillate periodically about the straight lines which form the lines of equal phase in the field of the undisturbed main wave. The bearing errors occurring as a result of this deformation of the lines of equal phase become smaller (as will be immediately clear) as the dimensions of the antenna system are increased, and the possibility is thereby gained of eliminating the oscillations of the lines of constant phase in the disturbed field. The conditions in both direction-finding systems will be investigated in what follows, therefore, from the reception point of view. The results, however, can be transferred to transmission-conditions. (a-1, b-3, c-1, d-4, e-330, f-See Abstract No. 3811 for original citation)

4191. ANONYMOUS, "Phase Measurements with Oscillographs with Differing X- and Y-Amplifiers," Elektronik, vol. 9, no. 1, p. 20; January 1960. ABSTRACT: The method considered is the phase ellipse (Lissajous figure) method. The phase errors produced by X- and Y-amplifiers of differing frequency characteristics are discussed, and a simple RC-network for connection in the input circuit of one amplifier for correcting the errors is described. (a-3, b-2, c-4, d-4, e-0, f-Description)

4192. WIESNER, J. B., ABEL, W. G., BAILEY, D. K., BEVERAGE, H. H., ET AL., "Radio Transmission by Ionospheric and Tropospheric Scatter," Joint Technical Advisory Committee, Proc. IRE, vol. 43, no. 1, pp. 4-22, 30-44; January 1960. ABSTRACT: This report on "Radio Transmission by Ionospheric and Tropospheric Scatter" has been prepared as a supplement to "Radio Spectrum Conservation," an earlier comprehensive report which was completed by the Joint Technical Advisory Committee and published by the McGraw-Hill Book Company, Inc., in 1952. The purpose of "Radio Spectrum Conservation," as stated in the Introduction thereto, was "to analyze and evaluate the current uses of the radio spectrum and to formulate constructive suggestions for the future. Soon after publication of the report "Radio Spectrum Conservation," two new methods for beyond-the-horizon extended-range radio transmission began to emerge as major advances in the communication art. The importance of these new radio techniques, now usually described as "ionospheric scatter" and "tropospheric scatter," led the Joint Technical Advisory Committee in February 1955, to establish an Ad Hoc Subcommittee on Forward Scatter Transmission. It was the task of this Subcommittee to compile factual data on the new scatter techniques and to prepare a report on "Radio Transmission by Ionospheric and Tropospheric Scatter" to supplement the book "Radio Spectrum Conservation." In 1955, the Subcommittee, in cooperation with the IRE Professional Group on Antennas and Propagation, sponsored publication of the October, 1955, Scatter Propagation Issue of the Proceedings of the IRE. This special issue aided greatly in consolidating and disseminating authoritative information on scatter transmission - and remains a major and lasting contribution to the technical literature. Recently, the Subcommittee completed preparation of the present report which, hopefully, will serve usefully to augment "Radio Spectrum Conservation" (particularly Chapter 2 - Propagation Characteristics of the Radio Spectrum), as well as to summarize those

unique features of ionospheric and tropospheric scatter which now must be considered in planning for future efficient utilization of the radio spectrum. The members of the JTAC Ad Hoc Subcommittee on Forward Scatter Transmission were: J. B. WIESNER, Chairman, W. G. ABEL, L. G. ABRAHAM, D. K. BAILEY, H. H. BEVERAGE, K. BULLINGTON, J. H. CHISHOLM, H. V. COTTONY, R. C. KIRBY, W. E. MORROW, JR., K. A. NORTON, W. H. RADFORD, J. F. ROCHE, T. F. ROGERS and R. J. SLUTZ. Messrs. R. M. DAVIS, R. G. MERRILL, V. R. ESHLEMAN, and A. D. WHEELON assisted in the preparation of Sections 2 and 3 of Chapter 1 - Ionospheric Scatter Transmission. Compilation of this report was completed under the guidance of W. H. RADFORD. (a-1, b-1, c-1, d-1, e-0, f-Special survey report)

4193. ABEL, F., AND LIEPMANN, W. H., "Antenna Group OA-716 (XE-1)/GL," Alford, Andrew, Consulting Engineers, Boston, Massachusetts, Final Technical Report on Contract DA 36-039-sc-64491, ASTIA No. AD-236 104. See also Department of Commerce PB148545; January 1960. ABSTRACT: The Antenna Group OA-716 (XE-1)/GL is a passive, high-gain, transportable, search antenna system used with a receiving set to detect the presence of electromagnetic signals throughout the frequency range of 12,000 megacycles to 18,000 megacycles. A broadly directional antenna, 10 - 15° horizontal beam width, is used for searching. A highly directional antenna, 1 - 1.5° horizontal beam width, is used for direction finding. The vertical beam width of both antennas is 10 - 15°. Both antennas are circularly polarized. Position or velocity servos are used to rotate the antennas. The azimuth orientation of the antennas is indicated on direction indicator dials, and the intercepted signal may be fed to a receiving set. A broadband waveguide rotary joint was developed for use in this antenna system. (a-1, b-3, c-1, d-1, e-0, f-Description and evaluation)

4194. AINBINDER, I. M., "The Calculation of Noise in Radio Receivers," Radiotekhnika, vol 15, no. 1, pp. 48-59; January 1960. ABSTRACT: It is shown how to calculate the noise performance of a complete communication system starting with the contributions made by cosmic noise, circuit noise and valve noise at the appropriate stages. (a-3, b-2, c-2, d-2, d-0, f-Analysis)

4195. BAERNER, K., "Direction Indicator Errors in Rotating Radio VHF Beacons," Zeit fuer Flugwissenschaften, vol. 8, no. 1, pp. 8-17; January 1960. ABSTRACT: Reflecting objects in vicinity of ground installation are considerable source of errors as these objects act as secondary radiators distorting primary information on azimuth given by beacon; component of total error, referred to as site error, is explained; conclusions are applied to errors of VHF rotating beacon at Hamburg, caused by two hangars of Deutsche Lufthansa on airport. (a-3, b-2, c-4, d-4, e-0, f-Beacon bearing error analysis)

4196. BALL, C. O., AND WHITE, W. D., "Simulation Tests on an Interference Rejection Antenna System," IRE Internat. Convention Record, vol. 8, Part 8, pp. 3-9; 1960. ABSTRACT: The system considered consists of three identical receptor elements suitably arrayed in space. The element outputs are so phased that signals arriving from a desired direction are all in phase at the input to the computing equipment. An interfering signal will generally arrive from a different direction. Thus, it will perturb the desired signal components at the computer input with equal magnitude deviations but different relative phases. The perturbed signals, considered as complex quantities, lie on the circumference of a circle and the centre of the circle corresponds to the desired signal. The computer utilizes this fact to recover the desired signal by estimating the position of the centre of this circle. Receiver noise further perturbs the inputs so that an averaging procedure is desirable in obtaining the required phases. This is possible since the relative phases of the interference source change only as rapidly as the spatial motion of the interference source itself. This computational procedure was simulated on a digital computer, taking account of the effects of receiver noise. The results indicate that, for an interference source sufficiently removed from the direction of the desired source, the residual interference can be reduced to the point where it is masked by the receiver noise. This is true for interference signals as much as 40 dB above noise level. The extension of the technique to include rejection of several interference sources simultaneously is possible in principle, but the equipment complexity required rises very fast as the number of signals to be cancelled is increased. (a-3, b-1, c-1, d-1, e-0, f-Sumulator test)

4197. BELL, J., "Correlation between Fading Signals. Instrument for Determining Correlation Coefficient," Electronic Technol., vol. 37, no. 1, pp. 36-40, January 1960. ABSTRACT: Simple resistance-capacitance circuits enable the positive rectified fading signals, obtained at the outputs of two conventional radio receivers, to be made to fluctuate about zero. The instantaneous sum and the instantaneous difference of the fluctuations are then separately squared, smoothed, and displayed continuously on pen recordings. The correlation coefficient R can then be estimated quickly from these recordings. Circuit details are given, together with tests indicating that errors in R exceeding ±0.1 should not occur. (a-3, b-2, c-1, d-5, e-0, f-Analysis)

4198. BELOUSOV, S. P., AND YAMPOL'SKII, V. G., "A Single-Wire Travelling-Wave Aerial for Medium-Wave Reception," Radiotekhnika, vol. 15, no. 1, pp. 16-25; January 1960. ABSTRACT: Examines the design criteria of a single-wire travelling wave aerial (Beverage aerial) and of several of its variants. The maximum gain is dependent on the optimum length of the aerial which varies with the nature of the soil and with the probable angle of tilt of the incoming wave. An approximate expression is obtained for the optimum length of the aerial for arbitrary values of the attenuation coefficient. (a-3, b-2, c-2, d-2, e-615, f-Theory and analysis)

4199. BOLGIANO, L. P., "A Theorem Regarding the Commutation of Antenna Rotations," IRE Trans., vol AP-8, no. 1, pp. 10.-105; January 1960. ABSTRACT: Ordinarily, when an aerial is rotated successively about mutually perpendicular earth-fixed axes such as axes pointing up, north, and west, the order in which the successive rotations are made cannot be reversed without obtaining a very different final aerial orientation. An analytic proof that the same final aerial orientation can always be obtained with the rotation order reversed as with the rotations performed in correct order is given. To accomplish this it is necessary when reversing the order of rotation only to also reidentify the axes of rotation. The required reidentification is obtained by considering the axes as detached from the earth and permitted to turn with the aerial as would lines painted on the aerial before the rotations are begun. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4200. CUFFLIN, M. H., "Aerial Calibration by Solar Noise Using Polar Display," Marconi Rev., vol. 23, pp. 33-44; 1st Quarter, 1960. ABSTRACT: During the summer of 1957, some experimental investigations were made at Bedell's End, near Chelmsford, with two objects in view. One was the possibility of using the radio noise of the sun as a suitably remote source for plotting the vertical polar diagram of an aerial. The other was an attempt to repeat an observation made by Eastwood in 1955 of a suspected reflection from the moon during a very intense eruption of solar noise. The usefulness of the first aim was successfully demonstrated and has since been applied in research. The experimental equipment used is described and the reasons for particular circuit arrangements, with a description of some interesting records, are given. The second object of the work was not achieved. Normally, the level of the solar radiation was insufficient, but on the occasion when the sun was in an enhanced state of activity the moon was not in a position suitable for observation. (a-3, b-2, c-1, d-5, e-0, f-Descriptive analysis)

4201. EASTWOOD, E., "Aerial Investigations Using Natural Noise Sources," Marconi Rev., vol. 23, pp. 2-20; 1st Quarter, 1960. ABSTRACT: Describes experiments which utilize the quiet sun as a noise source at varying angles of elevation, in order to establish the radiation diagrams of the high performance radars required to provide the operational environment demanded by modern aircraft. The sun is a variable noise source and during its brief periods of enhancement spectacular radio and radar effects may sometimes result. A description is given of observations at 215 Mc/s made on the active sun of October 27th 1955 when evidence was obtained which suggests that a moon reflected signal was also obtained. Records are presented to illustrate the enhancement of the sun at sunrise on July 14th 1959. This event was followed by the reception of signals on July 15th 1959, which may be explained in terms of auroral activity consequent upon the arrival at the earth of charged particles emitted by the active sun. (a-3, b-2, c-1, d-5, e-0, f-Description of experiments)

4202. EHRENSPECK, H. W., "The Backfire Antenna, A New Type of Directional Line Source," Proc IRE, vol. 48, no. 1, pp. 109-110; January 1960. ABSTRACT: This type of aerial consists of a slow-wave structure, such as a Yagi aerial, which is terminated in a conducting plane which reflects the travelling wave back to the feed point. The double traverse of the structure results in a radiation pattern equivalent to that of a structure of doubled length. Measured radiation patterns are plotted in order to show the effects of reflecting planes of various sizes. (a-3, b-1, c-1, d-1, e-0, f-Description)

4203. FULTON, B., SANDOZ, O., AND WARREN, E., "The Lower Frequency Limits for F-Layer Radio Propagation," J. Geophys. Research, vol. 65, no. 1, pp. 177-183; January 1960. ABSTRACT:

The band of frequencies propagated via the ionosphere by the high-angle ray and that propagated by the low-angle ray are both limited at their low-frequency ends by reflections that occur at lower ionospheric heights. Methods are developed in this paper for the calculation of these limits. Oblique incidence sounders are used to record, as a function of frequency, the time required for radio waves to travel by ionospheric reflection between distant locations. The records for the Ottawa-Slough (England) and the Ottawa-Saskatoon circuits show that there is a well defined lower limit to the band of frequencies propagated by the F layers in daytime. Separate and generally different lower frequency limits exist for the high-angle and low-angle modes of propagation. At frequencies below these limits, both these modes are obscured by reflections that occur in the lower regions of the same layer or in a lower layer. Methods of establishing the lowest frequencies propagated by a given mode will be discussed in this paper. The conditions that determine these lower frequency limits may be inferred by using the concept of the reflection locus [Lejay and Lepechinsky, 1950; Petersen, 1951]. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4204. HANSEN, R. C., "Tables of Taylor Distributions for Circular Aperture Antennas," Trans. IRE, vol. AP-8, no. 1, pp. 23-26; January 1960. ABSTRACT: Tables of the circular aperture distributions described in the preceding paper by Taylor are given. Steps in the design process are illustrated by examples. Taylor's article extends a method of antenna design described in an earlier article by the same author. A family of continuous circular aperture distributions is developed in such a way as to involve only two independent parameters, A, a quantity uniquely related to the design sidelobe level and $\bar{n}$ a number controlling the degree of uniformity of the sidelobes. An asymptotic approach to the condition of uniform sidelobes thus becomes possible. (a-1, b-1, c-1, d-1, e-0, f-Formulae)

4205. HERITAGE, J. L., WEISBROD, S., AND FAY, W. J., "Experimental Studies of Meteor Echoes at 200 Mc," Trans. IRE, vol. AP-8, no. 1, pp. 57-61; January 1960. ABSTRACT: The paper describes experimental results of bistatic studies of meteor echoes at 200 mc using a high power source and highly directive antennas. The transmission paths studied ranged from 940 to 1800 km in length and included many off-great-circle paths. Diurnal burst rate curves are given for each path. Median duration of the VHF bursts is compared with theory. For certain paths, duty cycle and Doppler shift data are given. At some sites signals were received from ionization aligned with the Earth's magnetic field. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4206. LOH, S. C., "The Radiation Characteristics of a Sinuate Antenna," Canad. J. Phys., vol. 38, o. 1, pp. 119-127; January 1960. ABSTRACT: Rigorous expressions for the radiation field of an aerial of sinusoidal shape are derived on the assumption of a travelling-wave type of current distribution along the conductor. In order to illustrate the derived results an endfire aerial is designed and some calculations of radiation field are presented. (a-3, b-1, c-1, d-7, e-0, f-Theory)

4207. MANASSE, R., "Maximum Angular Accuracy of Tracking a Radio Star by Lobe Comparison," IRE Trans., vol. AP-8, no. 1, pp. 50-56; January 1960. ABSTRACT: A general expression is derived for the maximum angular accuracy of tracking a radio star by lobe comparison (or monopulse). This angular accuracy depends on the input signal-to-noise ratio, the wavelength, the time-bandwidth-product of signal integration, and the effective length of the aerial aperture. The maximum angular accuracy can be obtained, approximately, by performing a simple correlation of odd and even components of the aerial output. Angular accuracy formulae for simple dishes or for interferometers appear as special cases of the general result. An appendix discusses the interferometer technique in more detail, and the angular accuracy for the data processing technique used by Ryle (Proc. Roy. Soc. A, vol. 211, pp. 351-375, March 6, 1952) is compared with that obtained from the optimum processing. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4208. MITCHELL, G., "An Analogue Computer for Investigating the Directivity Characteristics of Complex Arrays of Unit Aerials," Post Off. Elect. Engrs' J., vol. 52, pt. 4, 246-250; January 1960. ABSTRACT: This analogue computer was designed to perform automatically the necessary computations for any array with from 50 to 200 unit aerials, in which the aerials are arranged along from one to sixteen diametral rows intersecting at a common point, and with a maximum of 14 aerials in any one diametral row. The computer can also be used on a semi-automatic basis for dealing with larger or more complex arrays. (a-3, b-1, c-1, d-5, e-0, f-Description)

4209. MARTIN, E. J., "Radiation Fields of Circular Loop Antennas by a Direct Integration Process," IRE Trans., vol. AP-8, pp. 105-107; January 1960. ABSTRACT: Generalized expressions are derived which describe the field at any point in space for loops with standing-wave or traveling-wave current distributions. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4210. PAPDOPOULOS, V. M., "Wave Propagation in a Coaxial System," Quart. Appl. Math., vol. 17, no. 4, pp. 423-436, January 1960. ABSTRACT: A solution is obtained for the problem of the propagation of electromagnetic waves in a semi-infinite flanged coaxial line with an infinite centre conductor, in terms of an infinite set of coefficients which are determined by an infinite set of linear equations. The solution is discussed, in detail, in limiting cases which illustrate properties both of a thin vertical aerial on a plane perfectly conducting earth, and of a thick aerial fed by a low impedance line. Numerical results are given in these cases. The possibility of a solution for any excitation frequency is also discussed. (a-3, b-1, c-1, d-1, e-0, f-Mathematical theory and analysis)

4211. PIERCE, J. N., AND STEIN, S., "Multiple Diversity with Nonindependent Fading," Proc. IRE, vol. 48, no. 1, pp. 89-104; January 1960. ABSTRACT: Previous analyses of diversity techniques are extended to include the performance of an optimum (maximal-ratio) combiner in the case of nonindependent signal-fading fluctuations, for an arbitrary number of diversity branches. The analysis includes the general possibility of correlations among the quadrature components of the various signals. Some computational simplifications for certain cases of physical interest are given, as well as a specific application to two problems in digital communications. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4212. SENGUPTA, D. L., "On Uniform and Linearly Tapered Long Yagi Antennas," IRE Trans., vol. AP-8, no. 1, pp. 11-17; January 1960. ABSTRACT: Travelling-wave analysis of long Yagi aerials is reviewed briefly. The method of designing a Yagi aerial from this viewpoint is discussed and some experimental results are given in order to verify the analysis. A long Yagi aerial, when designed according to the Hansen and Woodyard condition, has a sidelobe ratio of 9.32 dB in its radiation pattern, irrespective of length. It is shown that by varying the propagation constant linearly along the length of the aerial, the sidelobe ratio can be improved considerably without sacrificing much of the gain. This linear variation of the propagation constant may be obtained by slowly tapering the element lengths and/or element spacings along the length of the aerial. An approximate theory is developed for the linearly tapered Yagi aerial and it is verified by actual measurements. A comparison between radiation patterns of uniform and tapered long Yagi aerials clearly shows the advantage of tapering. (a-3, b-1, c-1, d-1, e-0, f-Survey and analysis)

4213. TAYLOR, T. T., "Design of Circular Apertures for Narrow Beamwidth and Low Sidelobes," IRE Trans., vol. AP-8, no. 1, pp. 17-22, January 1960. ABSTRACT: Extends a method of design described earlier. A family of continuous circular aperture distributions is developed in such a way as to involve only two independent parameters, A, a quantity uniquely related to the design side-lobe level and $\bar{n}$ a number controlling the degree of uniformity of the sidelobes. An asymptotic approach to the condition of uniform side-lobes thus becomes possible. A companion article contains aperture distribution tables and examples. (a-3, b-1, c-1, d-1, e-0, f-See Abstract No. 4204)

4214. ZUEHLKE, E., "Extension of the Validity Range of Calibration Equipment for Loop Aerials," Nachrichtentechnik, vol. 10, no. 1, pp. 21-23; January 1960. ABSTRACT: The calibration method of Swinyard is extended so as to be applicable to arbitrary values of ℓ/λ, ℓ being the distance between the transmitting and receiving aerials. The effect of ground characteristics, however, remains unconsidered. (a-3, b-2, c-4, d-4, e-0, f-Calibration techniques)

4215. WILSON, P. S., "Development and Evaluation of Navarho Long Distance Navigation System," Rome Air Development Center, Griffiss AFB, Project No. 8760, Report No. RADC TR 59-107, ASTIA No. AD-234 392; January 1960. ABSTRACT: The Navarho Program is the most recent Air Force effort directed toward the development and evaluation of a low frequency, long distance, ground based, radio navigation system. The purpose of the development was to evolve a navigation system combining the advantages of previous systems but eliminating, insofar as possible, the disadvantages. A rhotheta

technique was chosen, largely because it was believed that such geometry would provide a circular service area with uniform accuracy in all directions from the ground facility. The program included the development of both airborne receiving equipment and a ground based transmitter facility. While the accuracies required by military specifications were not fully met, it is indicated that, with certain refinements, the system would be fully adequate for world-wide, peacetime applications. (a-1, b-3, c-1, d-1, e-0, f-Development report)

4216. TRAVERS, D. N., "Instructions for Measuring Electrical Soil Constants by Gill's Method," Southwest Research Institute, Internal Memorandum; 1 January 1960. ABSTRACT: This instruction describes a simplified method for measuring the conductivity σ, and the dielectric constant K, of the soil at short wave radio frequencies. These instructions need only be followed up through Section .II and the data taken forwarded in accordance with instructions to be furnished. (a-1, b-9, c-1, d-1, e-425, f-Measurements)

4217. HUNTER, R. E., AND COLBY, R. B., "Engineering Test Model, Antenna AS-1019 (EX-1)/TRD: A Low Frequency Extension of Modification Kit Electronic Equipment MK-383/TRD. Design and Fabricate 50 - 320 Mc. DF Antenna," Granger Associates, Palo Alto, California, Quarterly Progress Report No. 1, 1 August to 1 November 1959, Contract No. DA 36-039-sc-84533, see also Department of Commerce PB 147423, ASTIA No. AD 233019; 2 January 1960. ABSTRACT: The electrical design has been finalized using a log-periodic transposed-dipole array as the basic element. The log-periodic antenna has the characteristic that its radiation and impedance characteristics repeat as the frequency is changed by a factor, hence very large bandwidths with essentially constant radiation and impedance characteristics are obtainable. Two of these elements are mounted on the same axis to give both horizontal and vertical polarization; and three of these structures, consisting of two elements each, are arrayed forming the complete antenna. The antenna parameters have been optimized and are given in this report. Patterns for all modes of operation, as well as illustrative developmental patterns, are given. Impedance data for the element is also given. The VSWR of one antenna, relative to 75 ohms, is 1.3:1. For lobe-switched operation the half-power beamwidths are 42 degrees and 45 degrees for horizontal and vertical polarization, respectively. The equal-amplitude points are between 3 and 4 db for vertical polarization and from 2.8 to 3.6 db for horizontal polarization. In single-lobe operation the half power beamwidth is 65 degrees for horizontal polarization and 95 degrees for vertical polarization. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4218. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures," A.R.F. Products, River Forest, Illinois, Interim Engineering Report No. 6, Contract Nobsr 77636, ASTIA No. AD-323350; 8 January 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4219. BRYHNI, O., "Measurements on Receiving Aerials for Television and Metre-Waves," Elektrotek. T., vol. 73, no. 2, pp. 17-22; 15 January 1960. ABSTRACT: Describes a rapid automatic method for display of aerial polar radiation diagrams. A large radar-type c.r.t is used for display. Its deflection coils can be rotated by a synchro unit, and the aerial to be measured is mounted on a 6 m mast which can be rotated either by hand or by a controlled built-in motor. The apparatus can also be used for impedance measurements. Radiation patterns and impedance charts obtained with the equipment are shown for dipoles and 10-element Yagi arrays. (a-3, b-2, c-21, d-21, e-0, f-Description)

4220. TRAVERS, D. N., AND MOORE, J. D., "Antennas for Reradiation Error Reduction," Southwest Research Institute, Report No. 20, Contract No. NObsr 64515; 26 January 1960. ABSTRACT: The performance of the three-loop antenna prototype is reviewed. During the past quarter additional performance data on the equipment was obtained by a detailed inspection of the spectrum near the mast resonant frequency. The three-loop antenna prototype was operated through a 72-hour life test without any important malfunction. The equipment is ready for test on a Naval ship. The calibration equipment for use with the three-loop antenna prototype when it is tested on shipboard is described. This equipment, which includes an automatic function for use with the pure simple loop pattern and a semiautomatic function for use with the pure spaced loop and general three-loop function, is ready for the shipboard tests of the prototype antenna. The status of the work on the various basic antenna investigations performed in accordance with Project Phase V is reviewed. Detailed information is given which covers the investigations currently active. (a-1, b-3, c-1, d-1, e-1000, f-Interim report, see Abstract No. 4134)

4221. ANONYMOUS, "Countermeasures Direction-Finding Antenna," General Electronic Labs, Cambridge, Massachusetts, Interim Report No. 5. Contract NObsr 72753, ASTIA No. AD-322 913; 31 January 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4222. BAILEY, A. D., DYSON, J. D., AND SYDNOR, R. L., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," Electrical Engineering Research Lab., University of Illinois, Urbana, Quarterly Progress Report No. 2, Contract No. DA 36-039-sc-84525, ASTIA No. AD-233 755; 31 January 1960. ABSTRACT: Studies and investigations were continued leading to the design of a radio direction finding system for the MF-HF-VHF range. Present efforts concern the continuation of the study phase of several proposed radio direction finding systems. The RDF system capable of meeting the requirements will probably be of the intermediate or wide aperture type. A proposed sum-and-difference interferometer technique was shown to be practical in the operational sense. Quasi-Doppler systems are pertinent and a possible procedure for removing a serious objection to the system was indicated. The need for an elevation angle of arrival measuring system was stated. The elevation angle data are needed for (1) ray retracing, (2) estimation of the contribution to the variance of the indicated bearing due to lateral deviation effects, (3) interferometer calibration, and (4) correlation studies. Some results of a study of the use of simple arrays of frequency independent antennas for direction finding at VHF are given. (a-1, b-3, c-1, d-1, e-282, f-Progress report. See Abstract No. 4104)

4223. BAUR, K., "The Theory of the General Adcock Direction-Finder," Arch. Elekt. Übertragung, vol. 14, no. 1, pp. 1-14; January: no. 2, pp. 57-69; February 1960. ABSTRACT: The theory of the stationary Adcock direction-finder is presented in a manner sufficiently general to cover all cases likely to be encountered in practice. This generalization is made possible by taking account of the mutual coupling inside the system and by the arbitrariness of the radiation properties of the individual aerial elements. The limiting condition is imposed by the orientation of the elements in space and their uniformity making the system geometrically and electrically periodic over 360° in azimuth. The calculations presuppose the knowledge of the gain function for the existing polarization characteristics and the corresponding phase centre. (a-2, b-2, c-4, d-4, e-0, f-Theory)

4224. BAUR, VON K., "The Wave Analyser - An Equipment for Simultaneous Direction Finding of Several Incident Waves," Frequenz, vol. 14, no. 2, pp. 41-46; February 1960. ABSTRACT: Wave analyser, device for simultaneous direction finding of several incident wave trains; analysis of interference pattern by means of fixed antennas; equations, suitable for computer programming. (a-3, b-2, c-4, d-4, e-349, f-Description)

4225. DUNCAN, J. W., AND MINERVA, V. P., "100:1 Bandwidth Balun Transformer," Proc. IEE, vol. 48, no. 2, pp. 156-164; February 1960. ABSTRACT: The theory and design of a Chebyshev tapered balun transformer which will function over frequency bandwidths as great as 100:1 is presented. The balun is an impedance matching transition from coaxial line to a balanced, two-conductor line. The transition is accomplished by cutting open the outer wall of the coaxial line, so that a cross-sectional view shows a sector of the outer conductor removed. As one progresses along the balun from the coaxial end, the open sector varies from zero to almost 2π, yielding the transition to a two-conductor line. The balun impedance is tapered so that the input reflection coefficient follows a Chebyshev response in the pass band. To synthesize the impedance taper, the impedance of a slotted coaxial line was obtained by means of a variational solution which yielded upper and lower bounds to the exact impedance. Slotted line impedance was determined experimentally by painting the line cross-section on resistance card using silver paint and measuring the dc resistance of the section. The measured vswr of a test balun did not exceed 1.25:1 over a 50:1 bandwidth. Dissipative loss was less than 0.1 dB over most of the range. Measurements show that the unbalanced current at the output terminals is negligible. (a-3, b-1, c-1, d-1, e-0, f-Design theory)

4226. HARRINGTON, R. F., "Effect of Antenna Size on Gain, Bandwidth, and Efficiency," J. Res. Nat. Bur. Stand., vol. 64D, no. 1, p. 1; January-February 1960. ABSTRACT: A theoretical analysis is made of the effect of antenna size on parameters such as gain, bandwidth, and efficiency. Both near-zone and far-zone directive gains are considered. It is found that the maximum gain obtainable from a broad-band antenna is approximately equal to that of the uniformly illuminated aperture. If higher gain is desired, the antenna must necessarily be a narrow-band device. In fact, the input impedance becomes frequency

sensitive so rapidly that, for large antennas, no significant increase in gain over that of the uniformly illuminated aperture is possible. Also, if the antenna is lossy, the efficiency falls rapidly as the gain is increased over that of the uniformly illuminated aperture. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4227. HERSCH, W., "The Surface-Wave Aerial," Proc IEE, Monogr. 363E; February 1960. ABSTRACT: The radiation from the open-circuited end of an externally dielectric-coated metallic wave-guide can be controlled by varying the size of the guide, the thickness and/or the dielectric constant of the coating. A new type of aerial designed around this principle is given the name "surface-wave aerial" and radiation-pattern measurements are used to confirm the theory underlying this type of radiator. According to its mode of operation it belongs to the category of end-fire aerials, which are briefly reviewed to show that surface-wave aerials occupy a place in their own right amongst the many possible arrangements that utilize the end-fire effect to produce a directional radiation pattern. The theory of the surface-wave aerial is developed in detail, a necessary preliminary step being a full theoretical analysis of the properties of the first-order cylindrical surface wave. It is shown that a dielectric-coated cylinder which is approximately a wavelength in circumference can act as a waveguide for higher-order surface waves, of which the first order is an example. The "characteristic equation" is determined for the general case from which the cut-off frequency, propagation coefficient and conditions under under which propagation can take place are derived in turn. Two specific cases are evaluated numerically and the results are used to calculate the polar diagrams of surface-wave aerials operating at 9 Gc/s. The wavelength constant as well as the continuous radiation loss of a surface waveguide for which $\lambda_g/\lambda_o \doteq 1$ are measured directly and the results obtained are used to account for the radiation pattern of very long aerials. In conclusion, an outline of future work is given. (a-3, b-1, c-1, d-5, e-0, f-Analysis and design)

4228. HUNTER, R. E., "Engineering Test Model, Antenna AS-1019 (XE-1)/TRD. Design and Fabricate 50 - 320 Mc. DF Antenna," Granger Associates, Palo Alto, California, Quarterly Progress Report No. 2 on Contract No. DA 36-039-sc-84533. See also Department of Commerce PB147424, ASTIA No. AD-234 863; February 1960. ABSTRACT: The majority of effort during this period was expended finalizing the design of the D/F antenna array with its supporting structure and preparing engineering drawings for these items for release to the manufacturing departments. The stress analysis was based upon wind loadings of 25 pounds per square foot (100 mph winds) from a direction relative to the antenna found to provide the maximum loads. Besides contractual environmental requirements, the D/F antenna array was designed to withstand handling and mis-handling of components and assemblies during field installation. These conditions were considered in conjunction with the weight limit established by the contractual specifications. The engineering drawings were prepared to meet military specifications as much as possible and specify all military specifications pertaining to the production of the parts. Fabrication was started on the first unit and associated tooling. Any items requiring long procurement time were ordered for both units. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 4217)

4229. KAMPCZYK, W., "Some Properties and Applications of High-Permeability Ferrites," Siemens - Z., vol. 34, no. 2, pp. 90-96; February 1960. ABSTRACT: A brief comparison with the potential uses of metallic magnetic materials is followed by an account of important applications for high-permeability ferrites and the properties required or desired in this connection under given operating and environmental conditions. For various groups of applications there is in each case an optimum core shape that may readily be made of ferrite and determined by calculation. (a-3, b-2, c-4, d-4, e-0, f-Ferrite applications)

4230. MACMILLAN, R. S., RUSCH, W. V. T., AND GOLDEN, R. M., "A Very-Low-Frequency Antenna for Investigating the Ionosphere with Horizontally Polarized Radio Waves," J. Res. Nat. Bur. Stand., vol. 64D, no. 1, pp. 27-35; January-February 1960. ABSTRACT: The advantages of a horizontal half-wave resonant aerial for vlf propagation experiments lie in its relatively simple and inexpensive construction and in its radiation pattern which is maximum in the vertical direction. The radiation fields of this type of aerial located at the surface of a conducting earth consist of: (1) a horizontally polarized space-wave field radiated in the perpendicular bisector plane of the aerial; and (2) a vertically polarized groundwave field radiated along the axis of the aerial. This vertically polarized field is zero at right angles to the aerial. These fields have been experimentally verified. The use of a 50 kc/s horizontal half-wave aerial for vertical-incidence ionospheric sounding experiments is described. The radiation pattern is well suited for ionospheric soundings since a receiver located in the groundwave null receives only the reflected skywave signal. Ground-resistivity measurements made at a number of locations in Central and Southern California were correlated with the geology of the terrain. This correlation showed that the ground resistivity is highest (a condition necessary for optimum aerial efficiency) in aerials where the underlying rock formations are relatively unfractured. The amount of annual rainfall and other climatic conditions have little or no effect on the resistivity. Finally, a unique aerial system is presented which employs resonant loading circuits to convert a section of an existing power line into a horizontal half-wave vlf transmitting aerial. (a-3, b-1, c-1, d-1, e-0, f-Design description and analysis)

4231. MCLEISH, C. W., "Measurements of Coastal Deviation of High-Frequency Radio Waves," J. Res. Nat. Bur. Stand., vol. 64D, no. 1, p. 57; January-February 1960. ABSTRACT: The angular deviation of the phase front of a wave propagated across a fresh water shoreline has been measured over the frequency range from 3 to 20 Mc. The deviation is found to be roughly half that which theoretically would be obtained if the same sites were adjacent to infinitely conducting surfaces. (a-1, b-1, c-1, d-1, e-0, f-Experimental measurement)

4232. MIRAM, P., AND PALM, E., "Rhombic Antennas with Optimum Performance," Nachrichtentech Z., vol. 13, no. 2, pp. 82-91; February 1960. ABSTRACT: Analysis of radiation impedance and attenuation factor; improved calculation formulas; tables and graphs on antenna gain and efficiency as function of input impedance; design suggestions, which include that of rhombic antenna with gradually changing taper angle. (a-3, b-2, c-4, d-4, e-0, f-Rhombic design parameters)

4233. STANLEY, G. M., "Layered Earth Propagation in the Vicinity of Point Barrow, Alaska," J. Res. Nat. Bur. Stand., vol. 64D, no. 1, pp. 95-97; January-February 1960. ABSTRACT: The relative field strength of a vertically polarized low-frequency radio signal was measured as a function of distance over several radial paths in the vicinity of Point Barrow, Alaska. The attenuation of the recorded signal was very much less than predicted by the theory of propagation of a ground wave signal over a plane, homogeneous, infinitely conducting earth. The analysis of these data in terms of a plane, layered, finitely conducting earth appears to resolve the anomaly. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4234. YEN, K. C., AND VILLARD, O. G., "Fading and Attenuation of High-Frequency Radio Waves Propagated over Long Paths Crossing the Aurora., Temperate and Equatorial Zones," J. atmos. terrest. Phys., vol. 17, no. 4, pp. 255-270; February 1960. ABSTRACT: This investigation is primarily concerned with the fading and attenuation of high-frequency radio signals propagated over a long path crossing the auroral zone. The fading of high-frequency signals propagated over non-auroral paths of comparable length has also been studied, and some new results are obtained. The principal fading and attenuation measurements on which these conclusions are based were carried out in August 1957. For the auroral paths, there is no diurnal variation in fading speed except for a distinct minimum in time interval 1330-1900 PST, during which time the fading speed has little apparent dependence on magnetic activity along the path. In other time periods a positive correlation between magnetic activity and fading speed is found. It is suggested that the period of minimum fading speed is a consequence of the existence at that time of the kind of propagation mode made possible by ionospheric tilts. Attenuation over the long auroral-zone path is found to be associated with "polar blackouts" as indicated by the absence of returned echo in vertical sounders located along the path. The percentage association varies with the location of the station relative to the path. This variation is consistent with the inferred propagation modes. It is found that during the hours 1330-1900 PST the attenuation cannot be attributed to the absorption that gives rise to blackouts as it can in the other hours. This is also explainable on the basis of the postulated tilt-mode propagation. Similar observations for temperate-latitude and transequatorial paths of comparable length indicate that there is strong diurnal variation in fading speed. Some plausible explanations are offered. (a-3, b-1, c-1, d-5, e-0, f-Study)

4235. ZETZMANN, H. J., WENDLINGER, R. A., AND ZAUSCHER, H., "Investigations on Erratic D.F. Indications in Medium-Wave Radio Beacons," Ministry of Aviation, Great Britain, ASTIA No. AD-237 351; February 1960. ABSTRACT: The present work explains the observation of the erratic direction indications of a radio range guide beam in the case of direction finding using D/F equipment, hitherto not to be interpreted on physical grounds. It is proved by theoretical and experimental investigations that the jump in the direction in the rhythm of the scanning of the radio range is caused by the

interference of two incident waves at the observation point from different transmitters of the same or approximately the same frequency. The reception of the radio range is disturbed by a long-range transmitter. The indication depends both on the particular "beat" phase of the incidental frequencies and also on their amplitude ratio. In the case of unscanned transmitters, this produces an unsymmetrical slow oscillation about the true direction. With brief variations in amplitude, as e. g. with the scanning of pilot beams or identification signals, the change in the direction can be erratic. The investigation clearly shows that neither propagation phenomena of wireless waves nor the properties of the D/F equipment play any part in bringing about this directional error. In the case of an operational interference in the radio navigation (divergence in the indication of a radio compass on board an aircraft) which can occur given certain geographical-space conditions, there is a simple possible means of preventing the occurrence of directional errors by slightly displacing the frequency of one of the transmitters in question. (a-1, b-3, c-1, d-4, e-0, f-Translation from German)

4236. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures, VLF," A.R.F. Products, Inc., River Forest, Illinois, Interim Engineering Report No. 7, Contract NObsr-77636, ASTIA No. AD-322 034; 5 February 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0. See Abstract No. 4218)

4237. FROMWILLER, L., "Sub Assembly Tester for Avionics Equipment," Hickok Electrical Instrument Company, Cleveland, Ohio, Quarterly Progress Report No. 5, Contract No. DA 36-039-sc-78122, ASTIA No. AD-234 061; 15 February 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 4147)

4238. GILLSTRAP, L. O., JR., "Fix Location Techniques Study," Melpar, Inc., Falls Church, Virginia, Contract No. AF 30(602)1987, ASTIA No. AD-316 734; 23 February 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4239. ANONYMOUS, "Satellite Tracking," Canoga Division, Underwood Corporation, Fort Walton Beach, Florida, Technical Note No. 3, Contract No. AF 08(635)204, ASTIA No. AD-233 699; March 1960. ABSTRACT: This technical note describes modifications and additions to the satellite tracking system, designed to increase the accuracy, reliability and simplicity of the system. The modifications include the addition of a recorder to directly plot Doppler curves as they are being received. Several recordings of actual passes are also included. (a-1, b-3, c-1, d-1, e-0, f-Description of equipment modification)

4240. ALEKSANDROV, M. S., "Distribution of Phase Differences of Oscillations in the Presence of Fluctuating Signal, Noise, and Correlated Noise Interference," Radiotekhnika, vol. 5, no. 3, pp. 360-365; March 1960. See also Radio Eng. and Electronics (translation), vol. 4, no. 3, pp. 9-17; 1960. ABSTRACT: In radio-navigational aids operating on the principle of measuring phase difference of two oscillating signals, errors can be caused by fluctuation of the signals, noise and interference. A mathematical theory of the subject is given, which makes it possible to evaluate probable errors. (a-3, b-2, c-1 and 2, d-2, e-0, f-Theory)

4241. AMENT, W. S., "Reciprocity and Scattering by Certain Rough Surfaces," IRE Trans., vol. AP-8, no. 2, pp. 167-174; March 1960. ABSTRACT: Reciprocity theorems are developed for the average field specularly reflected, and the average power randomly scattered, to a point by a statistically described array of objects. A reciprocal quasi-variational expression for the average power is developed for use when the self-consistent method applies to calculating currents in the individual objects. This formula is applied to calculate differential scattering cross-sections for two idealized arrays bounded by plane "rough surfaces." General conclusions, relating to reciprocity, power conservation, grazing behaviour, etc., for rough surface scattering, are made and applied heuristically to show that grazing reflection and backscatter from the rough ocean should be independent of polarization. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4242. ANDREWS, R. E., "Development of Manpack UHF Radio Receiver R-903/( )/PRD," Microwave Engineering Labs., Inc., Palo Alto, California, Quarterly Progress Report No. 3, Contract DA 36-039-sc-78354, ASTIA No. AD-238 293; March 1960. ABSTRACT: The developmental results obtained for antenna coupling and mixer coupling loops used with the rotary-tuned preselector cavity for tuning the 380 mc to 1050 mc band are given. Single-cavity bandwidths of 2.8 mc at the low frequency end to 13 mc at the high frequency end are obtained. Difficulty is encountered in obtaining adequate low end bandwidth without unduly increasing the high end bandwidth. The preliminary performance of a triple-tuned preselector using the rotary-tuned cavities indicates a bandwidth range of 7.8 mc at 400 mc to 13 mc at 900 mc with an overcoupled response resulting in 6 db of peak-to-peak bandpass amplitude ripple at the low frequency end. Mid-band noise figures below 14 db are obtained for the preselector and 60 mc first IF amplifier combination. Tests of a varactor diode harmonic generator using a rotary-tuned cavity as a load at 750 mc and with an input of 250 mc result in a one frequency performance of 4.2 db conversion loss. The performance of a model of the 4.3 mc second IF amplifier employing bandwidth switching between 0.1 mc and 0.75 mc by means of partial interstage switching is discussed and the printed board model is pictured. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4148)

4243. ASHBROOK, F. M., AND STEVENSON, D. D., "The Navy's Portable Satellite Tracking Stations," IRE Trans., vol. SET-6, no. 1, pp. 41-45; March 1960. ABSTRACT: The stations described recover Doppler frequencies to an accuracy of one part in 10^9 and subcarrier oscillator frequencies to 15 kc/s bandwidths. Coherent phase detection and a tracking local oscillator to minimise required reception bandwidth maximizes signal sensitivity. Station portability accommodates rapid changes of location as dictated by satellite projects and the flexibility of the receiving and recording equipment due to unitised construction permits inexpensive modifications to accommodate present and future satellite programmes. (a-3, b-1, c-1, d-1, e-0, f-Description)

4244. BAILEY, A. D., DYSON, J. D., AND SYDNOR, R. L., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-84525, ASTIA No. AD-238 867; March 1960. ABSTRACT: Efforts were continued to conduct studies and investigations which will lead to the design of a radio direction finding system for the MF-HF-VHF range. Some experimental studies on the correlation between signal components and direction of arrival have been started. Additional proposals have been made for RDF systems using sum and difference interferometer system techniques and true phase comparison techniques. Of these, SADIST III and the true phase comparisons type appear to show most promise. A general purpose electronic analog computer could be programmed to provide all of the calibrations that are necessary for the interpretation of interferometer data. Development work on a panoramic RDF system and on a travelling wave antenna RDF system were continued. (a-1, b-3, c-1, d-1, e-282, f-Progress report. See Abstract No. 4222)

4245. CLEAVER, R. F., SOTHCOTT, P., AND ROBINSON, F. J., "An Automatic Radio Triangulation System," Proc. IEE, Paper 3243E; March 1960. ,Symposium on Data Handling and Display Systems for Air Traffic Control. See also Proc. IEE, vol. 107B, Suppl. 9, p. 22; 1960. ABSTRACT: Describes an automatic position-finding system for aircraft making use of the signals radiated in the course of ordinary communication with the ground, and not requiring any special equipment in the air. A network of automatic direction-finders on the ground feeds bearings to a control centre where they are displayed virtually instantaneously on a map. The operational requirements which have influenced the development of the system are discussed, and a brief reference to the history of position-finding by D/F triangulation is followed by an account of the main technical features of the present system, with particular reference to the method of bearing transmission to the control centre and the problems of display. A practical approach to the planning of D/F triangulation networks for specified accuracy and coverage is described, followed by details of of some systems which have gone into service and of the methods used in testing them on signals from aircraft. Typical results are given. The paper concludes with an indication of the need for further development of display methods. (a-2, b-1, c-1, d-5, e-0, f-Description)

4246. DE VOOGT, A. H., "Ionospheric Models as an Aid for the Calculation of Ionospheric Propagation Quantities," Proc. IRE, vol. 48, no. 3, pp. 341-346; March 1960. ABSTRACT: A continuation of a study. Results are given in the form of curves, and a comparison is made with ionograms. The important influence of radiation angle on the muf is shown. A large enough number of adequate models (60 to 100) might be valuable to the radio engineer for prediction and design purposes. (a-3, b-1, c-1, d-1, e-0, f-Propagation - theory)

4247. ELLIS, F., "Accurate Tracking for Radio Theodolites," Electronic Industr., vol. 19, no. 3, pp. 118-120; March 1960.

ABSTRACT: Describes with the aid of block and part-circuit diagrams the design of equipment to control the azimuth and elevation of the 10 ft diameter aerial system of a weather sonde tracking radio theodolite. A system static accuracy of 0.01° and a dynamic accuracy of better than 0.03° rms are achieved. (a-3, b-2, c-1, d-1, e-0, f-Description)

4248. ELLIS, G. R. A., "Directional Observations of 5 Kc/s Radiation from the Earth's Outer Atmosphere," J. geophys. Res., vol. 65, no. 3, pp. 839-843; March 1960. ABSTRACT: Low-frequency radio noise bursts associated with geomagnetic disturbances have been observed with a network of direction-finding receivers in southeastern Australia during September and October 1959. Over a range of longitudes from 135°E to 155°E, 18 noise bursts came from apparent sources at latitudes greater than 42°S. On 8 occasions, isolated, discrete noise sources with an average geographical size of 550 km were detected at latitudes between 34°S and 42°S. (a-1, b-1, c-1, d-1, e-759, f-Experimental results)

4249. FARMER, J. C., AND WHITNEY, M. F., "A Survey of Data Handling for Air Traffic Control," Proc. IEE, vol. 107B, Suppl. 19, pp. 1-11, 32-35; March 1960. ABSTRACT: Gives a short description of the current methods of exercising air traffic control and attempts to bring out those problems, both current and future, which might be solved or eased by the application of electronic data processing and improved methods of data transfer. A review is then made of the new techniques and systems most likely to satisfy these requirements, and the manner in which the techniques described in the associated papers fit into the overall picture. Some indication is given of the extent to which these techniques have been or are being evaluated. The techniques examined will be those associated with the transmission of data, its storage, processing and display. (a-3, b-1, c-1, d-5, e-0, f-Survey)

4250. FIELDING, C. C., AND GIBBS, J. G., "Semi-Automatic Flight Control Using Extracted Radar Data," Proc. IEE, Paper 3247E, p. 4; March 1960. Symposium on Data Handling and Display Systems for Air Traffic Control. To be republished in vol. 107B; 1960. ABSTRACT: Improved accuracy of radar data coupled with the advent of digital data handling methods and improved communication facilities via digital ground/air data links could enable a major step forward to be made in the field of detailed flight control of aircraft. The requirements which already exist and are foreseen for flight control are examined, and some of the advantages to be gained are indicated. A review follows of how digital data processing techniques can be applied to solve many of the problems. An indication is given of the relationship and optimum balance between man and machine. Finally, information is given on the accuracy which can be expected from an up-to-date system. (a-3, b-1, c-1, d-5, e-0, f-Survey and description)

4251. FOLDES, P., AND KOMLOS, S. G., "Theoretical and Experimantal Study of Wide-Band Paraboloid Antenna with Central-Reflector Feed," R.C.A. Rev., vol. 21, no. 1, pp. 94-116; March 1960. ABSTRACT: The theory and measurements of a circularly symmetrical high-gain paraboloidal aerial with a central reflector are summarized. The results of the experiments prove that the method of geometrical optics is sufficiently accurate for the pattern calculations. To obtain a reasonably accurate prediction of impedance behaviour, however, the wave-theory method should be employed. Thus, it is possible to calculate the shape required to produce the given radiation pattern, while the elements needed to assure an impedance match are determined experimentally. (a-3, b-1, c-1, d-1, e-0, f-Theory and experiment)

4252. HAJOS, Z., "Phasemeter for 0.1 to 6 Mc/s," Slaboproudy Obzor, vol. 21, no. 3, pp. 140-144; 1960. ABSTRACT: The instrument consists of a display unit, measuring unit and electronic switch. The two voltages E (ψ_1) and E (ψ_2) are applied to the electronic switch which operates at 50 c/s and alternately passes one input signal during each half cycle. The signal from the switch is mixed with a local frequency, and a waveform having the frequency of 40 kc/s is obtained. This is amplified, limited and then converted into narrow pulses which are applied to the control grid of the display crt. The input signal frequency, after mixing, is also applied to the deflection plates of the display tube. A circular time-base is formed in this way. The pulses applied to the grid modulate the brightness of the time base. The phase difference can therefore be read directly from the time base by measuring the angular distance between the bright spots on the time base. The instrument can measure angles up to 360°, its error at frequencies up to 6 Mc/s being less than ±1°. A detailed diagram of the instrument is given. (a-3, b-1, c-19, d-19, e-0, f-Description)

4253. HEIM, D. S., "Comparison Study of Goniometer and Twin-Channel PDF Systems," Research Institute, University of Michigan, Ann Arbor, Technical Memorandum No. 75, Contract No. DA 36-039-sc-78283, ASTIA No. AD-244 428, March 1960. ABSTRACT: Research is concerned with a comparison of the Watson-Watt and goniometer radio direction-finding systems as applied to the tactical situation, where mobility and ease of maintenance are prime requirements. Speed of response, sensitivity, circuit complexity, etc., are discussed. It is concluded that the goniometer system, if properly designed, offers distinct advantages over the Watson-Watt system. (a-1, b-3, c-1, d-1, e-314, f-Equipment comparison)

4254. HINCKLEY, G. L. F., "An Experimental System for Automatic Radar Target Detection and Digital Coded Plot Extraction and Transmission," Proc. IEE, Paper 3248E; March 1960. Symposium on Data Handling and Display Systems for Air Traffic Control. To be republished in vol. 107B; 1960. ABSTRACT: The system provides means for the automatic detection, extraction and digital encoding of the search plot data available from 2-dimensional radar equipments. Conversion from polar to Cartesian co-ordinates is effected, and the encoded Cartesian plot data are transmitted for remote use over long distances using a single telephone circuit. Full radar accuracy, resolution and data are maintained. The local or remote coded plot data are suitable for decoding and display or for direct insertion into a digital computer programmed for filtering, plot correlations into tracks, etc. (a-3, b-1, c-1, d-5, e-0, f-Description)

4255. GLENN, J. A., ET AL., "VLF Phase Characteristics Deduced from Atmospheric Wave Forms," J. geophys. Res., vol. 65, no. 3, pp. 907-912; March 1960. ABSTRACT: The wave forms of the electric field of atmospherics recorded at four widely separated stations are analyzed to yield the phase characteristics of radio waves at very low frequencies. It is indicated that the relative phase velocity for propagation to great distances is about 3 per cent greater than c (velocity of light in a vacuum) at 4 kc/s. Above this frequency, it gradually decreases, being about 1 per cent greater than c at 8 kc/s. The form of the dispersion curve is very close to that predicted by the mode theory. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4256. JEFFERS, C. L., AND KERSHNER, S. W., "Design and Performance Measurements on a New Anti-Fade Antenna for Radio Station WOAI," IRE Trans., vol. BC-6, no. 1, pp. 34-43; March 1960. ABSTRACT: A new anti-fade type radiator is described. Vertical radiation patterns are presented on the basis of computations from predicted current distributions. Measurements on a model generally confirm the performance predicted by the computations. Skywave measurements using pulse techniques were made on the full-scale aerial to determine the optimum tuning and the suppression of skywave signals. These measurements show skywave signals transmitted by both the E and F layers of the ionosphere. Final performance data are presented, including current-distribution measurements, vertical radiation pattern and groundwave field-intensity measurements. (a-3, b-1, c-1, d-1, e-0, f-Description)

4257. JOWETT, J. K. S., "V.H.F. Field-Strength Measurements over Paths in the Irish Sea Involving Mountain Obstacles. Their Application to a Particular Television Channel-Sharing Problem," Proc. IEE, Paper 3169E, vol. 107B, pp. 141-149; March 1960. ABSTRACT: A description is given of measurements made to compare the propagation of vhf signals over paths in Cardigan Bay and the Irish Sea, some of which involve transmission over high mountain ridges. Comparisons are made, based on simple knife-edge diffraction theory used together with published propagation data, between the expected and measured field strengths at various distances beyond the Isle of Man mountain ridge. The results of the second series of experiments are applied to confirm that that interference between co-channel television stations at Winter Hill, Lancashire and Black Mountain, Belfast should be at an acceptable level. (a-3, b-1, c-1, d-5, e-0, f-Description)

4258. KAHN, W. D., "Determination of Corrections to Mark II Minitrack Station Coordinates from Artificial Satellite Observations," J. geophys. Res., vol. 65, no. 3, pp. 845-849; March 1960. ABSTRACT: The Mark II Minitrack (radio interferometer system) receives satellite signals at a frequency of 108 Mc/s. Observations give the times corresponding to zero and 180° difference in phase of the satellite signal as it is received at two separate aerials. The predicted positions of the satellite for these times are compared with the deduced positions of the satellite for the same times. From these comparisons, corrections to the observer's latitude and longitude (but not height above the reference ellipsoid) are obtained. (a-3, b-1, c-1, d-1, e-0, f-Description)

4259. KIFT, F., "The Propagation of High-Frequency Radio Waves to Long Distances," Proc. IEE, Paper 3156E, vol. 107B, pp. 27-40; March 1960. ABSTRACT: The parabolic-layer transmission equation of Appleton and Beynon has been solved for a wide range of its main parameters. A method of applying the equation to any long-distance circuit, in which the successive hop lengths of each transmitted ray are adjusted to accord with ionospheric variations along the path, is described. The only data required are directly obtainable from published ionospheric predictions. The results are displayed on mode plots, which comprise (a) a mode-angle plot, showing the angles of elevation of all rays and the modes in which they are propagated to all points along a great circle of any extent, and (b) a mode-delay plot, showing the time of travel of all rays instead of their angles of elevation. The effect on the mode plots of diurnal and longer-term changes in the ionosphere is discussed. Two long paths are examined experimentally and it is shown that the number of signal components observed, their relative time-delays, their angles of elevation and their response to varying ionospheric conditions, all agree well with those determined theoretically from the mode plots, provided that the effects of the tropical-Es layer is included. Mode-angle plots may also be used without modification to find both the angular spectrum of back-scatter patterns and the most probable paths taken by atmospheric noise energy arriving at a receiver. Mode-delay plots also provide direct back-scatter patterns. The information on the plots may be used to improve aerial design and also to choose an optimum signalling frequency such that the number of active modes may be reduced, with a possible improvement in delay distortion of the signal. The choice of an optimum signal frequency is made possible by means of a mode-time plot, which shows the diurnal changes to be expected in propagation characteristics as determined by predicted changes in the ionosphere over the path. (a-3, b-1, c-1, d-5, e-0, f-Theory and experiment)

4260. KSIENSKI, A., "Synthesis of Nonseparable Two-Dimensional Patterns by Means of Planar Arrays," IRE Trans., vol. AP-8, no. 2, pp. 224-225; March 1960. ABSTRACT: It is shown that with a two-dimensional array of apertures, any desired radiation pattern, specified throughout the entire (θ, ϕ)-space can be synthesized, regardless of whether the pattern is separable into two independent patterns in the principal planes or not. Such an array can thus be made to synthesise any Fourier series in two-dimensions. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4261. LAPORT, E. A., AND VELDHUIS, A. C., "Improved Antennas of the Rhombic Class," R. C. A. Rev., vol. 21, no. 1, pp. 117-123; March 1960. ABSTRACT: Aerials are described that provide greater sidelobe suppression than conventional rhombic types, yet retain all the desirable features of the latter. Measured radiation patterns from a scale model, and from a full-scale double-rhomboid design are given. Simultaneous transatlantic transmissions with this aerial and with a conventional rhombic at 10 Mc/s are compared. (a-3, b-1, c-1, d-1, e-0, f-Description)

4262. LINNES, K. W., MERRICK, W. D., AND STEVENS, R., "Ground Antenna for Space Communication Systems," IRE Trans., vol. SET-6, no. 1, pp. 45-54; March 1960. ABSTRACT: An 85 ft diameter, equatorially mounted, parabolic reflector for satellite tracking is described. The aerial, similar to those used for radio astronomy, is located near Goldstone Lake near Barstow, Calif. The mechanical and electrical characteristics and subsystems are discussed, and performance in tracking the lunar probe Pioneer IV is described. (a-3, b-1, c-1, d-1, e-0, f-Description)

4263. LYON, G. F., "The Association of Visible Auroral Forms with Radar Echoes," Canad. J. Phys., vol. 38, no. 3, pp. 385-389; March 1960. ABSTRACT: A peak in 48.2 Mc/s echo occurrence is observed at Saskatoon corresponding in time to the period of breakup of quiet arc into active rayed structures. This is also the time of most frequent occurrence of characteristic "Curl" forms in the aurora. If, as Gartlein suggests, the "Curl" forms are formed by instabilities in a sheet beam then the primary particles are positively charged. (a-3, b-1, c-1, d-7, e-0, f-Experiment and observation report)

4264. MONTEATH, G. D., WHYTHE, D. J., AND HUGHES, K. W. T., "A Method of Amplitude and Phase Measurement in the VHF-UHF Band," Proc. IEE, vol. 107B, pp. 150-154; March 1960. ABSTRACT: A null method has been devised for measuring changes in the amplitude and phase of the transmission characteristic of a network at any frequency in the range 41-1000 Mc/s. A commercial instrument, designed for admittance measurement, is used with only slight modification for this application. Its subsequent use as an admittance meter is unaffected. The measurement of phase can be made to within about ±3°, unless a large variation of amplitude is encountered when reading accuracy limits the accuracy of phase measurement in the regions of small amplitude. If the error in a measurement is regarded as a vector, then, with any amplitude variation, the maximum value of the magnitude of this error vector is about 6% of the full-scale reading of the instrument. (a-3, b-1, c-1, d-5, e-0, f-Description)

4265. PERESADA, V. P., "Calculation of the Radiation Pattern of an Aerial with a Non-Plane Wave Incident upon It," Radiotekhnika, vol. 15, no. 3, pp. 18-24; March 1960. ABSTRACT: In the measurement of radiation patterns the incident em wave is considered substantially plane when the distance between the transmitting and receiving aerials satisfies the well-known relation $R > 2a_1a_2/\lambda$. Exact solution is obtained for two cases when: (a) on reception, the wavefront of the incident field is not plane, the knowledge of the pattern on transmission being a prerequisite; (b) the wavefront at the primary radiator is not plane due to various causes including interference due to reflections from the dish. For purposes of design and measurement, an approximate solution is obtained. (a-3, b-2, c-2, d-2, e-0, f-Analysis)

4266. SABIH, D., "A Method to Reduce Antenna Ground Reflections," IRE Trans., vol. AP-8, no. 2, pp. 225-227; March 1960. ABSTRACT: Describes a method for the elimination of ground reflections in aerial measurements. The signal driving the aerial under test is frequency-modulated and part of it is fed via a waveguide to the receiver. This signal beats with the incoming direct ray from the aerial and also with the unwanted ground-reflected ray. Because of the differences in propagation times for the three paths, and because of the sawtooth frequency sweep, the beat frequency for the direct ray will differ from that for the reflected ray which can be accordingly filtered out. Some typical figures are quoted for an X-band aerial example. (a-3, b-1, c-1, d-1, e-0, f-Description)

4267. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures, VLF," A. R. F. Products, Inc., River Forest, Illinois, Interim Report No. 8, Contract NObsr 77636, ASTIA No. AD-322 035; 3 March 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4 .36)

4268. TRAVERS, D. N., AND MOORE, J. D., "A Possible Means of Avoiding Shipboard Reradiation," Southwest Research Institute, San Antonio, Texas, Task Summary Report V on Contract No. 64585, ASTIA No. AD-246 010L; 25 March 1960. ABSTRACT: Reradiation error reduction in high frequency shipboard direction finders can be approached in three ways: (1) avoid reradiation by proper placement of the direction finder, (2) prevent reradiation by treating the reradiator in a suitable manner, and (3) accept reradiation and resolve the various directional components. Avoiding reradiation is reviewed in the light of new suggestions that siting locations heretofore unavailable may in the future be available for operational use. These new site-locations admit the possibility of a negligible reradiated field. Conditions for achieving a negligible reradiated field are reviewed for a ship similar to the USS Bache, and it is shown that to reduce maximum simple loop reradiation error to 12° it is necessary to either elevate the direction finder at least 230 feet above the water, or locate it at the water line, at a distance of approximately 500 feet from the foremast structure. It is concluded that the latter location may offer objections greater than those of elevating, and requirements to achieve elevation are then reviewed. Elevation may be achieved by a balloon or helicopter. For a balloon, the elevated equipment must be limited to 30 pounds, while for a helicopter weight restrictions are not severe. It is concluded that if experimental verification of the reradiation error reduction with altitude is desired, a helicopter-supported AN/SRD-7 antenna could provide data at a reasonably early date and for a variety of ships. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4269. BEAN, B. R., HORN, J. D., AND RIGGS, L. P., "Refraction of Radio Waves at Low Angles Within Various Air Masses," J. Geophys. Res., vol. 65, no. 4, pp. 1183-1187; April 1960. ABSTRACT: The refractive index structure and bending of radio rays within air masses of nonexponential refractive index height structure is treated in terms of the value expected in an average atmosphere of exponential form. It is demonstrated that refraction differences within air masses arise from departures of refractive index structure from the normal exponential decrease with height. The effect upon radio ray refraction of these departures from the normal exponential refractive index structure is most pronounced for small initial elevation angles of the radio ray. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4270. BEDNASH, C. S., AND CLIFFORD, V. F., "Direction Finder Group, UHF," ITT Labs., Nutley, New Jersey, Quarterly Progress

Report No. 6, ASTIA No. AD-240 613; 30 April 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Interim contract report. See Abstract No. 3933)

4271. EASTON, R. L., AND FLEMING, J. J., "The Navy Space Surveillance System," Proc. IRE, vol. 48, no. 4, pp. 663-669; April 1960. ABSTRACT: A complete system for satellite detection and tracking and for computations of satellite orbits is described. This detection system uses a cw transmitter separated from two receiving sites, all having fan-type co-planar aerial beams. The angle of arrival of the reflected signals is measured at each station by the use of an interferometer. The position of the reflecting object is inferred by the point in the fan aerial beam defined by the intersection of the arrival angles at the two receiving stations. Two radal (radio detection and location) devices of the type described have been installed in the southern U.S. In addition to the detecting and tracking installation the system includes data transmission lines, a data reduction centre, a very high speed computer for orbit determination and predictions, and display devices. (a-3, b-1, c-1, d-1, e-0, f-Description)

4272. FRANKLIN, R. G., AND BIRX, D. L., "A Study of Natural Electromagnetic Phenomena for Space Navigation," Proc. IRE, vol. 48, no. 4, pp. 532-541; April 1960. ABSTRACT: A study was made of the use of natural electromagnetic radiation in the space environment for navigation purposes. Radiations from the sun, stars, and interstellar space in both the visible and rf portions of the spectrum and also cosmic rays were investigated. Emphasis is placed on the measurement of velocity in space utilizing the Doppler phenomenon. Equipment and techniques useful in deriving velocity information from Doppler shift measurements are described and figures for expected accuracy are derived. Other passive techniques having possible application to space navigation such as the measurement of total solar radiation and solar diameter are briefly discussed. (a-3, b-1, c-1, d-1, e-0, f-Study)

4273. FULLER, A. J. B., "Data on Ferrite Materials When Used as Rod Cores in Solenoidal Inductors and Transformers," Electronic Engng., vol. 32, pp. 236-237; April 1960. ABSTRACT: Charts are presented which permit comparison of permeability and loss for various ferrites over the frequency range 2 to 80 Mc/s. Various rod specimens of ferrite material were used as the core of a coil whose impedance was measured. The results are presented in terms of a "low-level Q" and "insertion factor" of the material. (a-3, b-2, c-1, d-5, e-0, f-Ferrite measurements)

4274. KNUDSEN, H. L., AND LARSEN, T., "The Electric Field at the Ground Plane near a Top-Loaded Monopole Antenna with Special Regard to Electrically Small L- and T-Antennas," J. Res. Nat. Bur. Stand., vol. 64D, no. 2; March-April 1960. ABSTRACT: The present article deals with the calculation of the electric field strength at the ground plane near electrically small top-loaded antennas having a known current distribution, with special reference to L- and T-antennas. The formulas and numerical values obtained here for this component may be used in calculating the contribution to the ground losses around an antenna of the above-mentioned type due to the vertical component of the earth current. An exact expression involving an integral has been obtained for the electric field strength at the ground plane due to the current in a linear antenna having an arbitrary inclination. If the length and the height of the antenna is small compared to the wavelength, and if the current distribution on the antenna can be expressed by a finite number of terms of a power series, it is theoretically possible to obtain a closed expression for the field at the ground plane. However, only in special cases does this expression become sufficiently simple to be of practical value for numerical calculations. Working formulas have been obtained and numerical calculations carried out for the near zone field of an electrically small vertical or horizontal antenna with a linear current distribution. Based on these results, a calculation has been made of the electric field strength at the ground plane near electrically small L- and T-antennas. Also the relative contribution to this component due to the top loading has been calculated. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4275. STERLING, R., "Characteristics of a VOR on a 200-Foot Tower," National Aviation Facilities Experimental Center, Atlantic City, New Jersey, Final Report. See also Department of Commerce PB161949; April 1960. ABSTRACT: A mobile VOR station located in a cleared area 200 feet square at one corner of a heavily wooded site was flight tested. A maximum course scalloping of plus or minus 11.5° was recorded at a radius of 20 miles and an altitude of 1,000 feet. Later, a VOR antenna was erected on a 200-foot tower with a 60-foot-diameter counterpoise. Similar flight tests indicated a scalloping maximum of plus or minus 0.5°. A 20-mile-radius orbital flight in the first null (1.2°) produced scalloping of plus or minus 6° maximum. The distance range, for a receiver input signal of 5 microvolts, varied from 63 miles at 300 feet altitude to 175 miles at 9,000 feet altitude. It is shown that with an antenna 200 feet above ground, while there still are objectionable course bends in the nulls of the vertical plane radiation pattern, the detrimental effect of the site on VOR performance was reduced at low elevation angles, and the low-altitude coverage was extended. This type of installation should be useful in heavily wooded terrain where a suitable site cannot be obtained for the installation of a more conventional station. (a-3, b-3, c-1, d-1, e-0, f-Description)

4276. WAIT, J. R., "Terrestrial Propagation of Very-Low-Frequency Radio Waves," J. Res. Nat. Bur. Stand., vol. 64D, no. 2, March-April 1960. ABSTRACT: A self-contained treatment of the waveguide mode theory of the propagation of very-low-frequency radio waves is presented. The model of a flat earth with a sharply bounded and homogeneous ionosphere is treated for both vertical and horizontal dipole excitation. The properties of the modes are discussed in considerable detail. The influence of earth curvature is also considered by reformulating the problem using spherical wave functions of complex order. The modes in such a curved guide are investigated and despite the initial complexity of the general solution, many interesting and limiting cases may be treated in simple fashion to yield useful and convenient formulas for calculation. Other factors considered are the influence of the earth's magnetic field, antipodal effects, resonator type oscillations, and the influence of stratification at the lower edge of the ionosphere. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4277. LEADABRAND, R. L., "Radar Astronomy Symposium Report," J. geophys. Res., vol. 65, no. 4, pp. 1103-1118; April 1960. ABSTRACT: A symposium was held at San Diego in October 1959, as part of the technical programme of the United States National Committee of the International Scientific Radio Union. The subjects discussed included radar studies of the moon, sun and planets, radar studies of the exosphere and interplanetary medium and radar echoes from meteors and aurorae. (a-3, b-1, c-1, d-1, e-0, f-Symposium report)

4278. LEE, E. W., "Eddy-Current Effects in Rectangular Ferromagnetic Rods," Proc IEE, Monogr. 371 M, p. 8. April 1960. ABSTRACT: Expressions are obtained for the eddy-current distribution and the resulting loss angle for an infinitely long ferromagnetic rod of rectangular cross-section containing a number of domains magnetized parallel and anti-parallel to the axis of the rod and separated by domain wall running perpendicular to the long edge of the cross-section. Results are expressed in terms of the ratio of the lengths of the sides of the rod and number of walls. Two cases are considered: (a) the low-frequency limit in which the domain walls remain plane; and (b) the more general case in which the wall becomes bowed because of eddy-current screening effects. (a-3, b-1, c-1, d-5, e-0, f-Ferrite analysis)

4279. ANONYMOUS, "Phase I Report Addendum. Direction-Finding Subsystem. Volumes I and II," Sylvania Electronic Systems-West, Electronic Defense Laboratories, Mountain View, Calif., Report No. 302-PI-02, ASTIA Nos. AD-362 817 and AD-362 818; April 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4280. MOODY, A. B., "Navigation Using Signals from High-Altitude Satellites," Proc. IRE, vol. 48, no. 4, pp. 500-506; April 1960. ABSTRACT: Satellites in orbits a few hundred miles from the earth might be used in some form of piloting system, but orbit-prediction problems, limited coverage by individual satellites, and computer complexities are serious obstacles to be overcome by such a system. A different approach would be to place three or four satellites in orbits at an optimum distance somewhere between 1000 and 12,000 miles from the earth to serve as artificial celestial bodies in a system that would be a natural evolution from traditional celestrial navigation methods. A stabilized directional aerial operating with a receiver capable of accepting signals from both the satellites and the sun would provide angle measurement data both for fixing the position of the craft and also for establishing a north reference. The degree of sophistication of the user equipment would differ with requirements. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

4281. RAO, K. L., "Some Considerations in Design of Horizontal Rhombic Antenna," J. Instn. Telecomm. Engrs., vol. 6, no. 3, pp. 123-128; April 1960. ABSTRACT: Compromise in design of rhombic antenna because of limitations in pole height and site area is discussed; means for increasing radiating efficiency of rhombic antenna and reduction of minor lobes is also considered. (a-3, b-1, c-1, d-8, e-0, f-Design considerations)

4282. ANONYMOUS, "Spotlight QRC-119-(T)," Hallicrafters Company, Chicago, Illinois, Contract No. AF 33(604)21206, ASTIA No. AD-316 067, 1 April 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4283. CONFALONE, J., AND MORROW, P., "Electronic Reconnaissance Set," Airborne Instruments Lab., Inc., Long Island, New York, Quarterly Report No. 13, Contract No. AF 33(604)14319, ASTIA No. AD-316493; 1 April 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4284. ANONYMOUS, "Development of Transistorized and Modernized Interference Measuring Set AN/PRM-1, (XN-2)," Stoddart Aircraft Radio Company, Hollywood, California, Final Report on Phase 1 of Task 2, Contract NObsr 72677, ASTIA No. AD-258 396; 8 April 1960. ABSTRACT: A detailed description is presented of a transistorized interference measuring set AN/PRM-1(XN-2). Completely redesigned transistorized circuits were developed for the RF, IF, detector and voltmeter amplifier systems. Evaluation tests were performed and the general and factual data resulting from these tests are described. Also included are studies and comments upon the various aspects of the transistorized circuitry. Recommendations are given for improvement in the existing transistorized circuitry based upon the experience gained in the test performance. Specific requirements for construction of prototype models are given. (a-1, b-3, c-1, d-1, e-974, f-Description and project review)

4285. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures, VLF," A.R.F. Products, Inc., River Forest, Illinois, Interim Report No. 9, Contract NObsr 77636, ASTIA No. AD-322 036; 8 April 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4267)

4286. RICHRATH, W., "Antenna Proposal," A.R.F. Products, Inc., River Forest, Illinois, Special Engineering Report No. 2, Contract NObsr 77636, ASTIA No. AD-322 550; 12 April 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Proposal)

4287. TRAVERS, D. N., MOORE, J. D., AND SHERRILL, W. M., "Antennas and Methods for Reradiation Error Reduction in Shipboard Direction Finding," Southwest Research Institute, Interim Development Report, Contract No. Navy NObsr 64585, 26 April 1960. ABSTRACT: The recent effort toward a shipboard test of the three-loop prototype antenna is summarized for the portion of work contributed by Southwest Research personnel. The antenna is to be installed on the U.S.S. Richard E. Kraus, probably during July. A brief description of the installation configuration of antenna and mainmast is given. The method of Component Resolution is reported in detail for both twin channel and single channel direction finders suitable for shipboard use. Component Resolution attempts to resolve the reradiated field into the individual components of the field according to direction. Considerable detail is presented for a two-component field. The use of an analog to solve problems related to shipboard conditions is described. The investigation of ferrite antennas is reviewed and recent work reported in detail. Experiments to obtain higher order windings and patterns are reported. The use of a flat ferrite disc is reported and the possibilities for further investigation are reviewed. The status of the Balloon and Helicopter supported direction finder is mentioned. The status of other direction finding methods under consideration is reported. (a-1, b-3, c-1, d-1, e-1000, f-Engineering report. See Abstract No. 4220)

4288. ANONYMOUS, "Directory of Electronic Warfare Equipment. Volume I. Antennas and Direction Finding Equipment," HRB-Singer, Inc., State College, Pennsylvania, ASTIA No. AD-325 278; 29 April 1960. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-0)

4289. ALDRED, E. D., RIDDLE, M. M., ET AL., "Design and Fabrication of Receiver, Radio R-902(XE-1)/PRD," P. R. Mallory and Company, Indianapolis, Indiana, Progress Report No. 3, Contract No. DA 36-039-sc-78351, ASTIA No. AD-238 388; 30 April 1960. ABSTRACT: This work describes design work and test results on breadboarded circuits for Radio Receiver R-902 in accordance with Signal Corps Technical Requirements SCL-5483A. This receiver is a portable, low battery drain equipment covering the 100-400 mcs range. Test results and problems encountered in the preselector, local oscillator, and R.F. amplifier for the RF tuner section of the R-902 Receiver are discussed. Test results and problem areas concerning the construction of IF amplifiers, audio stage, chopper stage, and discriminator as well as a complete receiver are discussed. Front Panel Construction techniques are also described. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4290. AKSENOV, V. I., "Experimental Investigation of Electromagnetic Wave Scattering from Periodically Uneven Surfaces," Radiotekhnika i Elektronika, vol. 5, no. 5, pp. 782-795. Translation in Radio Engineering and Electronics; May 1960. ABSTRACT: Metallic and semiconducting surfaces with sinusoidal and sawtooth profiles were used in measurements of scattering of 7.95 mm waves. The experimental set-up in which square horns were used as transmitting and receiving aerials is described: both aerials could be rotated in order to vary the polarization. Measurement errors did not exceed 25% of the amplitude of the scattered wave. Existing theories are discussed and measurement results are compared with those obtained analytically. Discrepancy between experiment and theory increases with roughness of the surface, and none of the existing theories are fully satisfactory. (a-3, b-2, c-2, d-2, e-0, f-Study)

4291. BESAG, P. L., AND ANDERSON, J. T., "Determination of the Orbit of an Artificial Satellite," Proc. IRE, vol. 48, no. 5, p. 950; May 1960. ABSTRACT: This supplements a previous letter pointing out that in the solution for multistation Doppler tracking a geometrical relationship exists between the slant ranges. Through the use of this relationship sufficient equations for a full solution can be derived. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4292. BIBL, K., "Experimental Proof of Focusing at the Skip Distance by Backscatter Records," Proc. IRE, vol. 48, no. 5, pp. 956-957; May 1960. ABSTRACT: For more than half a year, backscatter records have been made at Breisach am Rhine on a fixed frequency of 16.65 Mc/s, using a pulse duration of 100 μsec. The records, of which typical examples are reproduced, show clear evidence of focusing on nearly every day, often for many hours and for both magneto-ionic components. The effect of focusing was less pronounced in summer than in winter, and at Breisach the focusing phenomena were less frequent and less important when observations were made in the directions of 250° and 280° than they were in the 220° direction. A statistical analysis of the results for the first 6 months of 1959, for the S. and S.W. directions, is given in a diagram which shows the degree of focusing observed each day in the periods morning, daytime, evening and night, the focusing being classified into four grades: 0 = no focusing; 1 = weak focusing; 2 = both components distinctly visible at skip distance; 3 = lasting a long time and components distinctly visible. On the frequency used, daytime focusing was only present in winter and night focusing was most frequent in spring. The over-all importance decreased in summer. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4293. CARTER, P. S., "Mutual Impedance Effects in Large Beam Scanning Arrays," IRE Trans., vol. AP-8, no. 3, pp. 276-285; May 1960. ABSTRACT: An analysis is presented of the driving-point impedance of the elements in a flat array of infinite vertical height but finite horizontal width. It is assumed that each of the elements is fed by a separate amplifier, having infinite internal impedance, and that the amplifiers can be phased to direct the beam at various positions in space. The radiating elements considered are infinitely long wires spaced on half-wavelength centres and half-wave dipoles spaced on half-wavelength centres, each backed by a conducting ground plane spaced λ/4 from the elements. Values of driving-point impedance are computed for the 61 elements in arrays 30 wavelengths wide. Values of the driving-point impedance near the centre of the array are found to agree closely with the values computed for infinitely wide arrays while the driving-point impedance of elements near the edge of the array are found to deviate considerably from the values at the centre. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4294. CLARKE, C., "Atmospheric Noise Structure. Measuring Equipment for 15 Kc/s-20 Mc/s," Electronic Technol., vol. 37, no. 5, pp. 197-204; May 1960. ABSTRACT: Equipment is described for measuring the following parameters of atmospheric radio noise as received on an omnidirectional aerial: (1) the amplitude probability distribution or the fraction of the time that the envelope lies above various thresholds, (2) the rate of arrival of the noise pulses and their amplitude distribution or, more generally, the number of occasions per second on which the noise envelope exceeds the threshold; (3) the average level of the envelope voltage; (4) the mean-square value of the envelope voltage, related to the noise power; and (5) the duration probability distribution of the noise bursts. The rf components of the atmospheric wave train are changed to an intermediate frequency of 10 kc/s within a bandwidth of 300 c/s, and all the measurements relate to the noise envelope in this bandwidth. The if envelope is also displayed on a double-gun cathode-ray tube for visual and photographic studies of the noise. This may be done in conjunction with a cathode-ray direction-finder operating at 10

kc/s, which provides directional information for linking the noise with the geographical distribution of thunderstorms. The noise envelope may also be recorded on magnetic tape and the replay analysed in a manner similar to that used for the original noise. (a-3, b-2, c-1, d-5, e-0, f-Description)

4295. EDELBERG, S., AND OLINER, A. A., "Mutual Coupling Effects in Large Antenna Arrays, I. Slot Arrays," Trans. IRE, vol. AP-8, no. 3, pp. 286-297; May 1960. ABSTRACT: A periodic structure approach is presented for the analysis of the impedance properties of large antenna arrays. The method is applied to a two-dimensional array of slots, in which each slot is fed by a separate waveguide and the array radiates into a half-space. The slot spacing and progressive phasing in the array may be arbitrary, however. The periodic structure approach permits a waveguide-type analysis of the half-space which automatically includes all mutual coupling effects. Both the susceptance and conductance of the slot are evaluated for arbitrary scan angle, and the effects associated with the appearance of higher order beams are considered. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4296. HUNTER, R. E., "Engineering Test Model, Antenna AS-1019 (XE-1)/TRD," Granger Associates, Palo Alto, California, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-84533, ASTIA No. AD-240 285; May 1960. ABSTRACT: The effort expended during this period was directed toward the production of Unit #1 and the preparation of that unit for testing. The antenna, its mast, and erection equipment were fabricated and assembled. A delay was experienced due to failure of the vendor to deliver the coaxial switch as scheduled, necessitating a slip in delivery date of the first unit. Upon receipt of this item, fabrication was completed and preliminary tests were conducted. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4228)

4297. JACOBS, E., "Predicting the Antenna's Role in R.F.I. [Radio Frequency Interference]," Electronic Industr., vol. 19, no. 5, pp. 96-102; May 1960. ABSTRACT: Starts by outlining the general principles of aerial design in regard to beamwidth, sidelobe level and interference. Goes on to describe the different regions of operation for small and large radiators, and considers the aerial characteristics for far field space transmission and the Fresnel region. Finally considers the question of spurious frequency interference. (a-3, b-2, c-1, d-1, e-0, f-Survey and discussion)

4298. KAISER, J. A., "The Archimedean Two-Wire Spiral Antenna," IRE Trans., vol. AP-8, no. 3, pp. 312-323; May 1960. ABSTRACT: A pair of equally excited but oppositely sensed Archimedean two-wire spirals situated close to one another in the same plane - a doublet - is used to generate a linearly polarized field in which the direction of polarization and phase are controlled or varied independently of each other by rotation of the spiral radiators. An array of these doublets can be made to scan by rotation of the several spiral elements; an eight-doublet array which was made to scan over an 83° sector with small amplitude variation is discussed. A doublet fed from a ring network can be employed as a polarization diversity circuit. A virtual doublet is achieved by placing a single spiral in a right angle trough. A preliminary scanning array comprising four spirals in a trough was made to scan ±36°. The possibility of using a parasitic spiral in conjunction with a driven spiral for obtaining linear polarization of variable direction and phase is indicated. A brief simplified analysis of the two-wire Archimedean spiral is also presented, which leads to the concept of higher-order modes of radiation. (a-3, b-1, c-1, d-1, e-0, f-Description)

4299. KIRKSCETHER, E. J., "Ground Constant Measurements Using a Section of Balanced Two-Wire Transmission Line," IRE Trans., vol. AP-8, no. 3, pp. 307-312; May 1960. ABSTRACT: When an open-circuited section of unshielded balanced two-wire transmission line is introduced perpendicularly into earth (or some sample under test), the electrical characteristics of the latter may be found by simple input-impedance measurements. By laboratory sample measurements the classical short- and open-circuited method can be used. Some exact and approximate procedures are presented and their utility and practical limitations discussed. Some precautions as to how possible errors and inexactnesses in the measurements and following calculations may be avoided are given. As an example, a typical earth sample is tested in a frequency range from 0.6 to 400 Mc/s, with graphical representation of the most important electrical constants: conductivity, dielectric constant, attenuation, velocity of propagation, etc., which exhibit great variations in the frequency range cited. The measurement method presented seems to be adequate to use in small mobile equipment, with which the ground in general can be tested in its original site and under natural conditions without the necessity of being removed. (a-3, b-1, c-1, d-1, e-0, f-Measurements)

4300. LEICHTER, M., "Beam Pointing Errors of Long Line Sources," Trans. IRE, vol. AP-8, no. 3, pp. 268-275; May 1960. ABSTRACT: Relation between statistics of antenna beam pointing direction and phase and amplitude errors at source has been obtained to first order in mean-square errors, under certain restrictions, for long line sources. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4301. LO, Y. T., "On the Beam Deviation Factor of a Parabolic Reflector," IRE Trans., vol. AP-8, no. 3, pp. 347-349; May 1960. ABSTRACT: Scanning can be achieved with a fixed parabolic reflector by physically displacing the feed in the focal plane. The beam deviation factor is defined as the ratio of beam deflection angle to angular displacement of feed, both angles being measured from the axis with the vertex as origin. An expression for the factor is derived and experimental and calculated curves of beam deviation factor as a function of the reflector parameters are given. (a-3, b-1, c-1, d-1, e-0, f-Descriptive theory)

4302. MATHIS, H. F., "Checking Design of Stepped Luneberg Lens," IRE Trans., vol. AP-8, no. 3, pp. 342-343; May 1960. ABSTRACT: Outlines a checking procedure based on geometrical optics using Snell's law and ignoring reflections. Formulae are derived relating the co-ordinates of an arbitrary emergent ray, at the focal radius, to the parameters of the lens. These may be used to determine rapidly how well any design of lens meets the required focusing specification. (a-3, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4303. MURTY, Y. S. N., AND KHASTGIR, S. R., "Polarization Parameters of the Downcoming Radio Wave," J. geophys. Res., vol. 65, no. 5, pp. 1449-1457; May 1960. ABSTRACT: The phase difference between the normal and abnormal components of the magnetic vector of the radio wave (i.e., the components in and at right angles to the plane containing the wave normal and the direction of the earth's magnetic field) and the limits of the tilt angle of the major axis of the polarization ellipse (traced out by the electric vector) measured anticlockwise with respect to the direction of magnetic north for the ordinary and extraordinary modes of propagation were obtained from the ray theory of propagation through the ionosphere. The values are given in a table for the ordinary and extraordinary modes in both hemispheres for regions below and above the level of ionospheric reflection. Scott's treatment of the same problem on ray theory and the results given by Roy and Verma on the basis of the coupled wave equations of Saha and others are reviewed. It is shown that discrepancies in the results of the polarization parameters obtained by different workers on ray theory are only apparent and arise out of differences in the forms and notations used in the different formulae. It is also shown that discrepancies in the limits of the major axis of the polarization ellipse obtained from ray theory and wave theory are due to the interchange in the expressions for the amplitude ratio of the normal to the abnormal components for the ordinary and extraordinary waves given by Saha and others. The experimental results of Roy and Verma are shown to confirm theoretical conclusions about the limits of the polarization ellipse. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4304. NEFF, H. P., AND TILLMAN, J. D., "An Omnidirectional Circular Antenna Array Excited Parasitically by a Central Driven Element," Trans. Amer. Inst. Elect. Engrs. I, vol. 79, pp. 190-192; 1960. ABSTRACT: A central dipole or unipole is surrounded by a ring of parasitic elements. This system radiates equally in all directions in the plane of the ring, but has a minimum in radiated signal at an angle to this plane. For a ring radius of about 0.4λ this minimum is very deep. By varying the length of the parasites or adjusting a terminating reactance in each parasite it is possible to control the direction of the minimum. Theoretical performance curves are given, and it is shown that these agree well with the experimental data. Such arrays have application to medium wave broadcast transmission. (a-3, b-1, c-1, d-1, e-0, f-Description)

4305. ANONYMOUS, "Rapid Scanning Search Antenna Set AN/TLA-2( )," General Electronic Labs., Cambridge, Massachusetts, Final Report, ASTIA No. AD-328 945; 4 May 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4306. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures, VLF," A.R.F. Products, Inc., Interim Engineering Report No. 10, Contract NObsr 77636, ASTIA No. AD-322 0?7; 6 May 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4285)

4307. ARNOLD, R. G., "Development of Antenna Group AN/GLA-4," J. and H. Smith Manufacturing Company, Newburgh, New York, Final Report, ASTIA No. AD-247 524, 17 May 1960. ABSTRACT: This report describes the development of a narrow/broad beam antenna group and positioning control system covering the frequency range of 1000 mc to 12,000 mc. The four feedhorn antennas may be used with or without the associated parabolic reflectors and are switched remotely to cover the frequency range. The broad-beam, low gain option may be used in the search type function and the narrow-beam, high gain option used to obtain accurate D/F bearings. The basic equipment is patterned somewhat after the AN/GLA-4(XE-1) model which was previously produced to provide a similar, but substantial change and additions have been made to expand usefulness and increase reliability. The Geneva Mechanism of the previous model (feedhorn drive) has been replaced by a helical gear drive with an index pin locking arrangement, and the drive motor power has been greatly increased to improve reliability, especially at low temperatures. The over-all circuitry has been redesigned to provide the option of Broad/Narrow beam operation, and to permit direct operation to the selected polarization position without the necessity to proceed in a predetermined cycle. The entire equipment is mounted atop a 20 ft tower complete with service platform, and includes a special housing for tuning units of the associated receiver. It is concluded that the previous design has been greatly improved in regard to function, convenience, and reliability. (a-1, b-3, c-1, d-1, e-0, f-Description)

4308. ANONYMOUS, "Antenna Group for Direction Finder Set AN/PRD-5( )," Systems, Inc., Interim Report No. 1, Contract No. DA 36-039-sc-78352, ASTIA No. AD-246 192; June 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4309. ANONYMOUS, "Automatic D.F. Receiver," Engineer, vol. 209, p. 1023; June 1960. ABSTRACT: For ships' direction-finding service in the medium-frequency range (250-550 kc/s), Marconi's Wireless Telegraph Company, Ltd., Chelmsford, Essex, has introduced the combined receiver and automatic radio goniometer illustrated. The equipment is designed to operate with the Marconi Bellini-Tosi aerial loops. In automatic operation the signal from the fixed loop aerial, resulting from displacement of the goniometer from the null point, is used in conjunction with the signal from the vertical aerial to produce a low-frequency error signal. This activates a servo motor which drives the goniometer to the null point. Sensitivity of the receiver is variable by the use of a two-step gain for automatic working with "normal" and "distant" settings, the former, used in areas of reasonable signal strength, reducing the fluctuations of the goniometer pointer due to excessive noise, while in the "distant" position sensitivity is increased by approximately 20 dB. A tuning meter enables the correct setting of the "Normal"/"Distant" control to be selected, and also facilitates accurate tuning. With the service switch in the "Test" position, the tuning meter can also be used to monitor valve feeds and voltages throughout the equipment. Provision is made for immediate switching from "Auto" to "Manual," enabling bearings to be taken of weak signals in the presence of stronger signals, a situation that might arise when dealing with a distress call. Controls for manual working are behind the hinged cover plate seen lowered in the illustration. The equipment is suitable for use with the leading makes of gyroscopic repeaters, making it unnecessary to plot ship's head, but a manually-adjusted Pelorus scale enables true bearings to be obtained when a gyro repeater is not fitted. (a-1, b-2, c-1, d-5, e-0, f-Description)

4310. ADACHI, S., "Impedance Characteristics of a Uniform Current Loop Having a Spherical Core," J. Res. Nat. Bur. Stand., vol. 64D, no. 3; May-June 1960. ABSTRACT: The radiation impedance is derived by the electromotive force method in a convenient form as the sum of the self-radiation impedance of a loop in the free space and an additional term due to the reaction between the loop and the sphere which is proportional to the well-known expansion coefficient of a magnetic-type scattered wave from a sphere in an incident plane wave. The first antiresonance frequency has been given in the form of a universal curve for a very small uniform current loop with core of an arbitrary composition of μ_g and ϵ_g, subject to the condition that the refraction coefficient $N = \sqrt{\mu_g \epsilon_g}$ is extremely large. Some numerical calculations show that high-μ core is desirable for a comparatively lower frequency region, and high-ϵ core is rather desirable in an antiresonance region. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4311. ARNOLDS, R., "Radar Display Transmission by Line Storage," Elektronik, vol. 9, no. 6, pp. 171-178; June 1960. ABSTRACT: The storage problem is analysed from the point of view of range and bearing resolution, and the maintenance of signal-noise ratio. Improvements in storage tubes and methods of write-in and read-out are described. In one tube the beam is shaped to a narrow rectangular cross-section and is deflected vertically by echo signals. Positive or negative signals can be read out by scanning horizontally at a suitable vertical level. Beam current modulation is unnecessary in this method. Resolution can be improved by using a circular scan. A double-beam tube is used with provision for exact superposition of the two circular traces. Only 90% of the trace is used for writing, but the reading scan uses the full circle, thus providing the dead time necessary for time-base operation. (a-3, b-2, c-4, d-4, e-0, f-Analysis)

4312. BAECHLE, J. R., AND MCFARLAND, R. H., "A Flush-Mounted Runway Antenna for Use with the F.A.A. Directional Glide-Path," Trans. IRE, vol. ANE-7, no. 2, pp. 32-39; June 1960. ABSTRACT: A flush-mounted airport runway antenna has been designed, built, and tested which will allow glide-path signals for instrument landings to be radiated directly from the touchdown point on the runway. Empirical and simplified analytical design procedures are discussed together with a comparison of desirable and measured antenna characteristics. Sufficient low-elevation angle directivity has been obtained from a prototype antenna to provide a path which extends well beyond 5 miles, the approximate distance at which the glide is intercepted in practice. (a-1, b-1, c-1, d-1, e-0, f-Description)

4313. BAILEY, A. D., DYSON, J. D., ET AL., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory, Progress Report No. 4, Contract No. DA 36-039-sc-84525, ASTIA No. AD-243 914; June 1960. ABSTRACT: Continued progress is reported on the design of a radio direction finder in the mf-hf-vhf range. Plan for the experimental phase of the propagation research task is outlined. Design decisions on the hf wide-base phase comparison and traveling-wave antenna RDF systems, respectively, have been made. An application of phase-lock principles to a spinning goniometer type system is outlined. Development work on a panoramic type RDF was continued. Progress toward the realization of an antenna for a VHF/UHF phase comparison RDF system is reported. (a-1, b-3, c-1, d-1, e-282, f-See Abstract No. 4244)

4314. BARANUL'KO, V. A., "The Transmission of Signals during Storms," Radiotekhnika, vol. 15, no. 6, p. 18; June 1960. ABSTRACT: Some general remarks, including a reference to Soviet experimental work with radio direction-finders on 50-200 Mc/s at distances up to 600 km. (a-3, b-2, c-2, d-2, e-0, f-Experimental results. Note: a translation exists in Radio Engineering)

4315. BEAN, B. R., AND DUTTON, E. J., "On the Calculation of the Departures of Radio Wave Bending from Normal," J. Res. Nat. Bur. Stand., vol. 64D, no. 3, p. 259; May-June 1960. ABSTRACT: The calculation of nonnormal tropospheric bending of radio waves is treated in terms of a reduced-to-sea-level value of the refractive index. This method emphasizes departures of bending from the average bending for the United States and consists of visualizing ray bending as consisting of two parts; an "average" component and a "departure-from-average" component. The "average" component comprises most of the bending and is obtained accurately from refraction tabulations while the component due to departures is easily obtained by graphical means. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4316. CROMBIE, D. D., "On the Mode Theory of Very-Low-Frequency Propagation in the Presence of a Transverse Magnetic Field," J. Res. Nat. Bur. Stand., vol. 64D, no. 3, pp. 265-267; May-June 1960. ABSTRACT: The effect of a purely transverse horizontal magnetic field on the propagation of very-low-frequency (vlf) waves is considered. It is shown that the magnetic field introduces nonreciprocity, and that for the propagation along the magnetic equator, the rate of attenuation is less for west-to-east propagation than for east-to-west propagation. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4317. DIXON, J. M., "Some Medium Frequency Sky Wave Measurements," Proc. IRE, Australia, vol. 21, no. 6, pp. 407-409; June 1960. ABSTRACT: Sky-wave field-strength measurements at broadcast frequencies for distances up to 2000 miles are reported for the period 1953-1958. Correlation of the field strength with sunspot number and E-layer critical frequency is discussed. (a-3, b-1, c-1, d-11, e-0, f-Experimental results)

4318. ERUKHIMOVICH, YU. A., "Some Problems of Direction Finding of Interfering Radio Waves," Radiotekhnika, vol. 15, no. 6, pp. 62-66; June 1960. Translation in Radio Engineering, pp. 90-99. ABSTRACT NO. 1: The operation of a direction finder with direct

reading on a crt is analysed for a case of reception of two interfering waves. The phenomena of ellipticity, of parallelogram, of wandering bearing and of apparent omnidirectional reception are explained. Practical recommendations are given for improvement of bearing reading. ABSTRACT NO. 2: An analysis is made of the process of direction finding for two radio interference waves by amplitude-type direct reading direction finders. The laws governing the phenomena of ellipticity and errors in bearings are elucidated together with the inter-connexion of these factors with the parameters of the arriving beams. The special role of the lateral deviation of radio waves from the arc of the Great Circle is discussed for the case when they are propagated along the earth. The phenomena of the "parallelogram," "wandering of the bearings" and "circle reception" are elucidated and practical recommendations made. (a_1-3, a_2-1, b-2, c-2, d-2, e-74, f-Analysis)

4319. FITZGERALD, R. T., BROWN, H. C., AND REED, M. D., "Radio Collision-Avoidance Systems for Aircraft," IRE Trans., vol. ANE-7, no. 2, pp. 40-54; June 1960. ABSTRACT: Several co-operative radio systems for avoiding aircraft collisions are considered from the standpoints of technical requirements, feasibility, and cost. The system with the broadest potential application is selected. In basic form, the selected system utilizes the upper uhf region to communicate altitude and heading information, and vertical manoeuvres are defined by the altitude information. In expanded form this system determines relative bearing and heading, to predict collision hazard in both the vertical and horizontal planes. Potentially, a reduction in unintentional collisions of 100:1 can be achieved with the selected approach. The applicability of this system to collision avoidance problems of military, commercial, and private aircraft, and to related problems of navigation and air traffic control is outlined. (a-3, b-1, c-1, d-1, e-0, f-Descriptions and discussion)

4320. FRICKE, H., "Frequency-Independent Measurement of Complex Quotients with the Goniometer," Elektrotech. Z. (E.T.Z.) A, vol. 81, no. 12, pp. 422-427; 6 June 1960. ABSTRACT: The fundamental principles of such goniometer measurements are described in detail. The resultant field of a goniometer depends on the ratio of the amplitudes and on the phase difference of the currents or voltages applied to the exciter systems, so that the quotient of two quantities may be determined from the spatial dependence of the search-coil output voltage. From observation of the resultant goniometer field, a working diagram can be derived which permits direct reading of complex quotients from the location and amplitude of the minimum of the search-coil output voltage. Typical equipments for use at low frequencies and in the usw range are described and experimental results are given. (a-3, b-2, c-4, d-4, e-0, f-Detailed goniometer - principles and uses)

4321. HART, R. G., "A Historical Survey of Radio and Radar Aids to Aircraft Navigation," J. Brit. Instn. Radio Engrs., vol. 20, no. 6, pp. 409-415; June 1960. ABSTRACT: The parallel evolution of the sciences of radio and of aeronautics in the same generation are traced in relation to applications of Radio to air navigation. This evolution was accelerated by radio techniques being deliberately applied to increasing the effectiveness of aircraft as weapons of war, and therefore the paper is in the main a review of the application of radio to navigation in the R.A.F. (a-1, b-1, c-1, d-5, e-0, f-Historical survey)

4322. KATZIN, M., PEZZNER, M., KOO, B. Y. C., ET AL., "The Trade-Wind Inversion as a Transoceanic Duct," J. Res. Nat. Bur. Stand., vol. 64D, no. 3, pp. 247-253; May-June 1960. ABSTRACT: Radiosonde data for stations in the South Atlantic trade-wind belt are analysed to determine the potentialities of the trade-wind inversion as an elevated duct for transoceanic radio transmission. These are supplemented by refractometer soundings made by an aircraft during the latter part of 1958. These records indicate that a duct is present in the majority of the cases. Since it is known that the radiosonde underestimates ducting because of its slow response, it is concluded that a duct is present practically all the time. On the basis of the data analysed, an experiment with two aircraft is suggested to test the propagation of this mechanism. A frequency of around 200 Mc/s appears to be a good choice for an initial experiment. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4323. KELLER, J. B., AND KARAL, F. C., "Surface Wave Excitation and Propagation," J. appl. Phys., vol. 31, no. 6, pp. 1039-1046; June 1960. ABSTRACT: A geometrical theory is developed for the analysis of surface-wave excitation and propagation. The surfaces along which the surface waves propagate may be either curved or flat, and may have either constant or variable properties. The theory is based on the concept of a complex or imaginary ray. The excitation coefficient which enters the theory is determined from the solution of a canonical problem - that of a line source over an impedance plane. Then the theory is applied to the surface wave excited by a line source on a wedge with variable surface impedance. The result agrees precisely with the asymptotic form of the exact solution. Another application is made to the surface wave excited on a cylinder by a line source. The result also agrees with the exact solution. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4324. KHASTGIR, S. R., AND SINGH, R. N., "The Size of the Moving Irregularities in the F-Region and the Spread Angle of the Radio Waves Scattered from Them," J. atmos. and terrest. Phys., vol. 18, nos. 2 and 3, pp. 123-126; June 1960. ABSTRACT: The three-spaced receiver fading records of the F-echo at ≥ 8 Mc/s, taken at Banaras during the period from November 1956 to September 1958 show certain characteristic patterns. The fading patterns which were considered as due entirely to the movement of large ionospheric irregularities are analysed by the method of Briggs and Phillips (1950). As a result of this analysis the average characteristic length of the irregularities is found to be 270 m and the average angular spread is found to by 6°. The variations of these parameters are shown with the help of histograms. The records show some diurnal and seasonal variations, but no definite conclusion can be made regarding such variations. The short-duration radio-frequency pulses incident on an ionospheric layer are reflected back to the ground in the form of a cone of rays. In the idealized case of a stationary ionosphere and plane wave illumination, the cone angle is very small but in the case of moving irregularities, the angle of spread is considerable. If these irregularities are of great size and move with certain velocity, they produce characteristic fading patterns which vary almost periodically without much change in their details. In the present paper some results are given concerning the size of the moving irregularities in the F-region and the angle of spread. These results are obtained from the analysis of those fading patterns which are considered to be due entirely to the movement of large irregularities in the ionospheric region. The fading records were taken during 1956-1958 at Banaras by the three-spaced receiver method of Mitra (1949). The apparatus consisted of a pulse transmitter giving a pulse width of 200 μsec at 50 c/s, and three receiving horizontal dipole aerials situated at the corners of a right-angled triangle with two arms in the E-W and N-S directions and each arm of length 100 m. The recording unit consisted of three communication receivers, the detector output of which was connected to three DuMont Oscillographs operated with a common time base. The simultaneous fading records at the three spaced points were taken by a ciné-camera. Those patterns which were not found to change in their details, and which could be regarded as due entirely to the movement of large irregularities were analysed by the method of Briggs and Phillips (1950). (a-1, b-1, c-1, d-5, e-0, f-Experimental theory and analysis)

4325. KLAUSER, H. U., "Radar Aerials and Scanners," Scientia Electrica, vol. 6, no. 2, pp. 53-74; June 1960. ABSTRACT: A survey is given for the wide field of microwave aerials, and in particular of applications in radar. Fundamental problems in the technique of directive aerials, scanners and equipment are discussed and finally some aerial systems are considered. (a-3, b-1, c-8, d-13, e-0, f-Survey)

4326. MARSHALL, F. J. M., "D.F. Loop for 75," QST, June 1960. ABSTRACT: Simple loop construction suitable for amateur radio enthusiasts. (a-4, b-1, c-1, d-1, e-0, f-Elementary loop design)

4327. MIYA, K., AND MATSUSHITA, S., "Recording Type Direction Finder," Trans. IRE, vol. CS-8, no. 2, pp. 81-82; June 1960. ABSTRACT: This is a reprint of paper appearing in Rep. Ionosphere Space Res., Japan, vol. 13, no. 2; June 1959. (a-4, b-1, c-1, d-6, e-0, f-Reprint. See Abstract No. 4066)

4328. MUELLER, H. G., "Methods of Measurement in Radioastronomy," Z. InstrumKde, vol. 68, no. 6, pp. 117-124; June 1960. ABSTRACT: Not available. (a-4, b-2, c-4, d-4, e-0, f-0)

4329. RICE, P. L., "Tropospheric Fields and Their Long-Term Variability as Reported by T.A.S.O.," Proc. IRE, vol. 48, no. 6(I), pp. 1021-1029; June 1960. ABSTRACT: Presents data from long-term recordings of radio field strength over a large number of propagation paths, and presents curves for predicting field strength over a smooth earth for frequencies between 40 and 1000 Mc/s. The basic data provided for the Television Allocations Stud, Organization during 1957 and 1958 include recordings made in several parts of the world and over various types of terrain and were supplied by numerous sources. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4330. WOLFE, J. L., "Measurements of the Last Few Periods of Sputnik III by a Radio Direction Finder," Canad. J. Phys., vol. 38, no. 6, p. 882; June 1960. ABSTRACT: The calculated times of crossing the 45th parallel along with the times of nearest approach to Ottawa (40° 0.21'N, 75° 0.34'W), and also the calculated mean periods, are tabulated for the last 2 weeks of life. (a-2, b-1, c-1, d-7, e-0, f-Experimental measurements)

4331. WRIGHT, C. M., "Ferrite Rods for Broadcast Receiver Antenna Coils," Proc. IRE, Australia, vol. 21, no. 6, pp. 410-412, June 1960. ABSTRACT: Equations are presented for the design of aerial coils wound on ferrite rods. (a-3, b-1 c-1, d-11, e-0, f-Ferrite design - theory)

4332. ZIEHM, G., "Reception and Direction-Finding Using Electromagnetic Waves in Sea Water," Telefunken Ztg., vol. 33, pp. 141-150; June 1960. ABSTRACT: It is known that some penetration of long-wave radio waves occurs in sea water so that they can be used for communication and direction-finding by submerged submarines. Two frequency ranges are of interest, one below 30 kc/s and the other between 30 and 300 kc/s. Results are given showing the depths at which reception is possible using a 1 MW transmitter at 16 kc/s. A typical value is 20 m at a total distance of 1000 km from the transmitter. (a-3, b-2, c-4, d-4, e-0, f-Experimental analysis)

4333. RICHRATH, W., MARTIN, J., AND OSINSKI, T., "Receiving System Countermeasures, VLF," A. R. F. Products, Inc., Interim Engineering Report No. 11, Contract NObsr 77636, ASTIA No. AD-322 551, 9 June 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4306)

4334. BELL, R. L., "Broadband Log-Periodic Antennas," Electronics, vol. 33, no. 25, pp. 58-59; 17 June 1960. ABSTRACT: Tapered arrays based upon geometrical iteration have frequency bandwidths up to 10:1. These arrays are discussed in general terms, and radiation diagrams are given for two typical forms. (a-3, b-2, c-1, d-1, e-0, f-Discussion)

4335. BECKWITH, H. M., NEWBERG, I. L., AND ROYAL, D. E., "Methods for Obtaining Direction Information of X-Band Electromagnetic Emitters," Thompson Ramo Wooldridge, Inc., Los Angeles, California, Final Technical Report; Contract No. AF 30(602)2038, ASTIA No. AD-319 374; 23 June 1960. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

4336. SCHNEIDER, R. F., "Development of Manpack UHF Radio Receiver R-903( )/PRD," Melabs, Palo Alto, California, Quarterly Progress Report No. 4, Contract No. DA 36-039-sc-78354, ASTIA No. AD-245 478; 29 June 1960. ABSTRACT: Development of common of common shaft triple tuned preselector tracking is described. Modification of the mixer coupling, and antenna input loop and a description of the final configuration are given. Tracking methods are described; the most effective process, bending of 10 degree segments in the tuning capacitor rotor. The development of VHF generation for the varactor multiplication local oscillator scheme is described. Resonant impedance of a true butterfly tuned circuit is measured. A formula to describe the shape of a butterfly capacitor for straight line frequency variation is derived. A rectangular inductor or prism cavity tuned with a butterfly capacitor is developed. Power output over the frequency range of 147 to 370 mcs with push-pull CK 7246's is obtained. Difficulties are encountered with a hole in the range and low efficiencies. Design and fabrication of a UHF local oscillator, using a 5675 pencil triode and similar tuned circuit, has been accomplished. The second mixer injection scheme is described. The required IF output, FM detection, CW detection, and audio amplifier results are noted. Difficulties in obtaining sufficient AVC action for all modes of operation have been encountered. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4242)

4337. NISHIMURA, R. K., "Investigation of Rotating Polarization Direction-Finding Techniques," Thompson Ramo Wooldridge, Inc., Los Angeles, California, Final Report, Contract No. AF 19(604)5733, ASTIA No. AD-319 427; 30 June 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4338. HOLLOMAN, T. W., AND KINGSLEY, O. L., "Bi-Cotar Miss-Distance Precision Vectors," Integrated Range Mission, White Sands Missile Range, N. Mexico, Final Report, ASTIA No. AD-244 742L; 30 June 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4339. ASHWELL, G. E., AND FOWLER, C. S., "Phase-Measuring Equipment for V. L. F. Propagation Investigations," Electronic Technol., vol. 37, no. 7, pp. 252-255; July 1960. ABSTRACT: The equipment described was developed to investigate the phase difference between the signals from a single very low-frequency (vlf) transmitter received at two sites simultaneously. A reference frequency at each site was derived from the pulse-recurrence frequency of the transmissions from stations of the Gee navigational system and, by using it to change the frequency of the received vlf signal, an audio-frequency signal was obtained which had the phase characteristics of the vlf signal. The af signal from one station was passed over a telephone line to the other station where the phase difference was measured between it and the local af produced in an identical manner. The long-term accuracy of measurement was ± 2° of phase in the frequency range 15-20 kc/s and the short-term accuracy, for periods up to 30 minutes, was better than ± 1° of phase. One station was designed to be mobile and satisfactory operation of the system was obtained with receiver separations up to 400 km. (a-3, b-2, c-1, d-5, e-0, f-Description)

4340. BAIN, W. C., "The Received-Amplitude Distribution Produced by Radio Sources of Random Occurrence and Phase," Proc. Instn. Elect. Engrs., Monogr. 389 E, pp. 20-24; July 1960. ABSTRACT: A theoretical calculation is given of the amplitude probability distribution to be expected on an ionospheric vhf forward-scatter circuit due to reflections from meteor trails alone. The analysis is based on the addition of a large number of signals with a frequency of occurrence inversely proportional to the square of their amplitude, and will therefore apply to other problems in which this relation holds. The calculated distribution is compared with a small number of practical results, and a method is outlined for deriving the relative proportion of meteoric and turbulent-scattering components in the signal. (a-3, b-1, c-1, d-5, e-0, f-Theory)

4341. BATES, H. F., "Direct HF Backscatter from the F Region," J. geophys. Res., vol. 65, no. 7, pp. 1993-2002; July 1960. ABSTRACT: Using the records of the oblique-incidence, sweep-frequency (1-25 Mc/s) scatter sounder located at College, Alaska, we show that a commonly observed winter daytime echo is direct scatter from a patch of field-aligned F-region irregularities. The range of this particular echo is constant with frequency out to its junction with the least-time-path echo. Because it is not enhanced by any type of focusing mechanism, we term it a strong-scatter echo A series of records for December 16, 1958, is shown and discussed in detail. The behavior of the strong-scatter F-region echo and another F-region direct-scatter echo during the transitional periods of sunrise and sunset indicates that the field-aligned irregularities are distributed randomly over wide areas at night but that during the day they exist only in relatively small patches. From this we infer that the sun has a smoothing effect on the ionosphere. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4342. BRAY, D. W., AND KIRCHNER, P. H., "Antenna Patterns from the Sun," Q.S.T., vol. 44, no. 7, pp. 11-15; July 1960. ABSTRACT: Gives an approximate method of plotting vertical radiation patterns by using the sun as a source of radio noise. The sun is tracked in azimuth over a period around sunrise or sunset. The sun's elevation is determined from latitude, date and formulae given. Before each reading of noise output, a resistor equal to the impedance of the transmission line is substituted for the aerial, and its output is noted. Received noise outputs are referred to the resistor outputs. (a-3, b-1, c-1, d-1, e-0, f-Description)

4343. HORNER, F., "The Design and Use of Instruments for Counting Local Lightning Flashes," Proc. IEE, Paper 3238 E, vol. 107B, pp. 321-330, July 1960. ABSTRACT: Instruments for counting local lightning flashes are reviewed and reasons are given for selecting one particular design for extensive tests. The importance of the aerial configuration is stressed. A 7 m vertical aerial has been adopted as a standard and the instruments have normally been adjusted to trigger on a 3 V signal from a built-in calibrator, corresponding to a field change of about 3 volts/m. With this arrangement, on a day on which thunder is heard, there is usually a maximum hourly count exceeding 30 and a total daily count exceeding 100. The effective range of a counter is defined in statistical terms and techniques for its measurement are discussed. Preliminary estimates of the effective range are derived from observations on a few local storms in England; with the standard instrument it is about 30 km. More observations are required to confirm the results, particularly in countries with frequent thunderstorms. Equipment should be standardized so far as possible. (a-3, b-1, c-1, d-5, e-0, f-Equipment survey)

4344. HORNER, F., "Extra-Terrestrial Radio Noise as a Source of Interference in the Frequency Range 30-1000 Mc/s," Proc. IEE, Paper 3267 E, vol. 107 B, pp. 373-376; July 1960. ABSTRACT: Published information on the intensity of noise from the galaxy, the sun and from other extra-terrestrial sources is presented in a form which shows their importance relative to the internal noise of typical receiving installations. Particular attention is paid to a halfwave horizontal dipole aerial and to an aerial with a 20° pencil-beam directed horizontally. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

4345. KAHN, W. D., "Radio Interferometry Applied to Geodesy," IRE Trans., vol. MIL-4, no. 2-3, pp. 259-263; April-July 1960. ABSTRACT: Mark II Minitrack, a basic type of radio interferometer, is used to obtain observational data from artificial earth satellites. It is assumed that the aerial field pattern can be approximated by a family of coaxial cones whose common apex is the electrical centre of the system. The mathematical theory of calibrating the system with stellar radio sources and the reduction of satellite observational data is given, with an error analysis of the system. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4346. KING, D. D., PACKARD, R. F., AND THOMAS, R. K., "Unequally-Spaced, Broad-Band Antenna Arrays," IRE Trans., vol. AP-8, no. 4, pp. 380-383; July 1960. ABSTRACT: Requirements for a broad-band, steerable linear array are given. The limitations due to grating lobes of an equally spaced array are discussed. Results are given of the study of several different unequally spaced arrays which have two advantages: fewer elements for comparable beamwidth; grating lobes and minor lobes replaced by sidelobes of unequal amplitude which are all less than the main beam. A scheme for controlling the cosine arguments in the radiation pattern formula is given which results in one of the best patterns of this study of unequally spaced arrays. The universal pattern factor was computed for an array having a set of spacings determined by this scheme. This array is capable of steering a beam ± 90° over a 2-to-1 frequency band with no sidelobe above -5 dB. It uses 21 elements, compared to 78 for an equally spaced array of similar beamwidth. The results obtained indicate that further study of the controlled cosine method and unequal spacing in general should result in better pattern characteristics. (a-3, b-1, c-1, d-1, e-0, f-Study and analysis)

4347. KLAUDER, J. R., "The Design of Radar Signals Having Both High Range Resolution and High Velocity Resolution," Bell Syst. tech. J., vol. 39, no. 4, pp. 809-820; July 1960. ABSTRACT: A discussion is presented of some fundamental limitations on simultaneous range - velocity determination in terms of ambiguity diagrams, with the aid of a quantum mechanical analogue to the Wigner distribution function. A sequence of signals is found in which the signals yield both range and velocity information with increasing accuracy. However, this desired property is not accompanied by a waveform suitable for maximum operating efficiency. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

4348. KLAUDER, J. R., PRICE, A. C., DARLINGTON, S., AND ALBERSHEIM, W. J., "The Theory and Design of Chirp Radars," Bell Syst. tech. J., vol. 39, no. 4, pp. 745-808; July 1960. ABSTRACT: A new radar technique has been developed that provides a solution for the conflicting requirements of simultaneous long-range and high-resolution performance in radar systems. This technique, called Chirp, recognizes that resolution depends on the transmitted pulse bandwidth. A long high-duty-factor transmitted pulse, with suitable modulation (linear frequency modulation in the case of Chirp), which covers a frequency interval many times the inherent bandwidth of the envelope, is employed. The receiver is designed to make optimum use of the additional signal bandwidth. Many of the important analytical methods required for the design of a Chirp radar system are given. The details of two signal generation methods are considered and the resulting signal waveforms and power spectra are calculated. The required receiver characteristics are derived and the receiver output waveforms are presented. The time - bandwidth product is introduced and related to the effective increase in the performance of Chirp systems. The concept of a matched filter is presented and used as a reference standard in receiver design. The effect of amplitude and phase distortion is analysed by the method of paired echo. One consequence of the signal design is the presence of time side lobes on the receiver output pulse analogous to the spatial side lobes in aerial theory. A method to reduce the time side lobes by weighting the pulse energy spectrum is explained in terms of pair echoes. The weighting process is described, and calculated pulse envelopes, weighting network characteristics and deleterious effects are presented. The effects of quadratic phase distortion are analysed and the resultant pulse envelopes are presented. The receiver response characteristics in the presence of Doppler-shifted signals from moving targets are examined. Schematic ambiguity diagrams are presented for current signal designs. (a-3, b-1, c-1, d-1, e-0, f-Description)

4349. KNIGHT, P., AND MONTEATH, G. D., "The Power Gain of Multi-Tiered V.H.F. Transmitting Aerials," B.B.C. Engng. Monogr., no. 31, pp. 5-38; July 1960. ABSTRACT: Transmitting aerials for vhf broadcasting usually consist of a number of similar groups or tiers of radiating element, spaced at intervals along a supporting mast. The power gain of such an arrangement depends on the number of tiers, on the spacing between them, and also on the vertical radiation pattern on each individual tier. A method of calculating the gain is described. Results computed for a comprehensive range of variables are presented in the form of tables. (a-3, b-1, c-1, d-5, e-0, f-Analysis)

4350. KRASILNIKOV, V. N., "Effect of Transmission Lines on Ground Field of Radio Waves," Radiotekhnika, vol. 15, no. 7, pp. 3-9; July 1960. See also Radio Engineering, vol. 15, no. 7, pp. 1-12; July 1960. ABSTRACT: A Study of disturbance to primary field of ground radio wave, caused by transmission line considered to be thin, rectilinear conductor parallel to surface of the earth. The analysis is of interest to radio-navigation development. (a-3, b-1, c-2 and 1, d-2, e-0, f-Theory)

4351. LEWIS, E. A., HARVEY, R. B., AND RASMUSSEN, J. E., "Hyperbolic Direction Finding with Sferics of Transatlantic Origin," J. geophys. Res., vol. 65, no. 7, 1879-1905; July 1960. ABSTRACT: The experimental "hyperbolic direction-finder" consists of an array of sferic receivers in the New England area, connected by wide-band data links so that microsecond differences in pulse arrival time can be measured. The hyperbolic directions can be determined from the time differences. In a series of coordinated runs, individual sferics originating in western Europe were observed by both the New England net and the sferics net of the British Meteorological Office. The British Meteorological Office furnished the geographic coordinates of the lightning strokes so that measurements of position could be compared. Tabulated results for 150 sferics show an average absolute deviation from the mean of only 31 nautical miles. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4352. LINDSAY, J. E., "A Circular Loop Antenna with Nonuniform Current Distribution," Trans IRE, vol. AP-8, no. 4, 439-41; July 1960. ABSTRACT: An analysis for the far field of a filimentary loop with nonuniform current distribution is presented. In order to obtain a possible current distribution, an analogy between a circular and a parallel-wire transmission line is made. This analogy yields a standing wave of current similar to that found on a lossy parallel-wire line. Considering only the far field of the aerial, differential expressions for magnetic flux density are set up and the resulting equation is solved. The solution gives the magnetic flux density at a distant point from the aerial. Loops with uniform current and loops with sinusoidal current distributions are shown to be special cases of the general solution. To verify the validity of the assumed current distribution, the experimental patterns of a loop 1λ long are compared with calculated patterns. Results indicate that the field solutions are probably applicable to loops many wavelengths long. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4353. ROSENTHAL, M. L., SHERMAN, D., AND GERE, A. J., "Antenna Set AN/TLA-4," General Electronics Labs., Inc., Cambridge, Massachusetts, Progress Report No. 6, Contract No. DA 36-039-sc-78-15, Project 3E44-03-001-04; see also ASTIA No. AD-319 882; July 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4354. ANONYMOUS, "Radio Direction Finder AN/BRD-4," Servo Corporation of America, Hicksville, New York, Report No. SCA-16400-R1, Contract No. NObsr-81281, ASTIA No. AD-322 884L; 15 July 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4355. THOMAS, J. A., AND MCNICOL, R. W. E., "A Highly Directive Rotating Array for 16 Mc/s," Nature, vol. 187, pp. 398-399; 30 July 1960. ABSTRACT: A brief description of an aerial system for studying field-aligned ionization in the F-region of the ionosphere. The effective half-power beam width is 8° and the speed of rotation is one revolution per 3 mins. (a-3, b , c-1, d-5, e-0, f-Description)

4356. ANONYMOUS, "Direction Finder Group, UHF," ITT Laboratories, Nutley, New Jersey, Quarterly Progress Report No. 7, Contract No. DA 36-039-sc-74839; ASTIA No. AD-250 940; 31 July

1960. ABSTRACT: The purpose of this contract is to design and construct a transportable direction finder covering the frequency range of 225 to 400 mc. This quarterly report covers the period of 1 May through 31 July 1960. This reporting period covers the progress of the three service test units. The three units under construction contain all of the necessary modifications to insure compliance with the subject specification. Modifications to the sense circuits and changes suggested after Government type testing of the engineering model of the AN/GRD-12 unit are included. All of the components of the antenna system have been received and the systems are in the process of assembly. The resolver units have been checked for insertion loss and instrumental accuracy. A new type of sense network has been incorporated into the assembly. This network shifts the phase of the signal voltage from one dipole with respect to the other dipole. (a-1, b-3, c-1, d-1, e-963, f-Progress report. See Abstract No. 4270)

4357. BLANKENSHIP, J. A., MCCORMICK, D. E., ET AL., "Target - ASA," US Army Security Agency Board, Arlington, Virginia, Project No. 59/P18/C26, Appendix I - III; ASTIA Nos. AD-323 481, AD-323 482, and AD-323 483; 31 July 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4358. ANONYMOUS, "A Summary of Literature Pertaining to High-Frequency Backscatter," Stanford University, Palo Alto, California, Radioscience Laboratory, Communication Group, Contract NOnr 225 (33); August 1960. ABSTRACT: A survey of literature pertaining to HF backscatter is presented in bibliographical form. Authors' abstracts have been included whenever possible. (a-1, b-3, c-1, d-1, e-749, f-Contents contain approximately 200 abstracts)

4359. BLYTHE, J. E., "Flight Trials of AN/ARA-25 UHF Homer at VHF Frequencies," Central Experimental and Proving Establishment (Canadian) Report No. 1521; ASTIA No. AD-248 345; August 1960. ABSTRACT: Research is reported to determine if the AN/ARA25 UHF Homer could be used satisfactorily at VHF frequencies with a view to using the UHF Homer presently installed in the Albatross aircraft for Search and Rescue missions against aircraft equipped with only VHF type Emergency Beacons. The ARA25 type UHF Homer installed in Argus aircraft serial number 20732 was tested against both high and low powered transmitters operating at 121.5 mcs, during three different flights, using two different types of VHF airborne receivers. From the results obtained during these tests it was concluded that the AN/ARA25 type UHF Homer is totally unsatisfactory against VHF Emergency Beacons, but may have limited usefulness against high powered shipborne, airborne or surface type VHF Transmitters for rendezvous purposes. (a-1, b-3, c-1, d-7, e-0, f-Evaluation report)

4360. [illegible]RNS, F. V., CRAVEN, J. H., ET AL., "Antenna System," National Research Council of Canada, Radio and Electrical Engineering Division, Report No. ERB-558; ASTIA No. AD-321 095; August 1960. ABSTRACT Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

4361. COX, L. G., "Operating and Maintenance Instructions - Recording Equipment of AN/GRD-501 Direction Finder," National Research Council of Canada, Radio and Electrical Engineering Division Report No. ERB-567; August 1960. ABSTRACT: The recording equipment of the AN/GRD-501 Direction Finder consists of a dual-drum magnetic recorder with associated electronic equipment and power supply. A rotating photomultiplier scanner produces a pulse whenever a tapered radial slot passes over the major axis of the trace on a bearing-display cathode-ray tube connected in parallel with the operator's bearing-display cathode-ray tube. The drums and scanner are gear-driven with an integral gear ratio between them, so that the angular position of the drum with respect to the record/playback head corresponds to a definite angular position of the slot on "record" or "playback". Since the recurrence frequency of the photomultiplier output pulses is too low to allow direct recording with the amplitude-modulated system in use, the pulses are used to drive a 5 kc/s balanced modulator which produces a recordable bearing signal. The audio signal is also recorded. (a-1, b-3, c-1, d-7, e-461, f-Instruction manual)

4362. DENISOV, N. G., "On the Influence of the Reflection Region on Radiowave Scattering in the Ionosphere," Izvestia VUZ, Radiofizika, vol. 3, no. 2, pp. 208-215; March 1960. See also Air Force Cambridge Research Laboratories translation D-135, AF 19(604) 7387, ERD-TN-60-787; August 1960. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-Theory)

4363. DUENO, B., "Measurement of Ionospheric Drift and Structure by Radio Star Observations," Puerto Rico University, College of Agriculture and Mechanic Arts, Final Report on Contract No. AF 19(604) 1918. See also Department of Commerce PB 152471; August 1960. ABSTRACT: This report is divided into three parts. The first part deals with fluctuation phenomena in relation to observations made during a period of two years. It is shown that there exists at this location a great increase in fluctuation activity during June and July which appears to be associated with the large scale changes taking place on the F-2 layer during the pre-sunrise period. Measurements of Drift Velocities of irregularities by the radio star method is discussed in the second part. It is found that for measurements made during the premidnight hours the drift is predominantly towards the south-east and the opposite direction for measurements taken after midnight. A physical interpretation of this behavior is given. The third part gives information, from a practical point of view, on the constructional details and operation of the phase switching interferometers used in this experiment. (a-1, b-3, c-1, d-1, e-0, f-Theoretical analysis)

4364. FEJER, J. A., "Scattering of Radio Waves by an Ionized Gas in Thermal Equilibrium in the Presence of a Uniform Magnetic Field," Canad. J. Phys., vol. 39, no. 5, pp. 716-740; May 1961. ABSTRACT: In an earlier paper a theory was developed for the scattering of radio waves by the electron density fluctuations that exist in an ionized gas in thermal equilibrium. The theory treated only the extreme cases where the "characteristic scale" of the scattering irregularities is either very much larger or very much smaller than the Debye length. The presence of only one type of singly charged ion was considered and the ion and electron temperatures were assumed equal. The effects of an external magnetic field were not taken into account. These earlier limitations are removed in the present paper and the effects of an external magnetic field are taken into account. It is shown that the total power is independent of the magnetic field and an expression for the frequency spectrum of scattered power in the presence of a uniform magnetic field is obtained. Useful approximations to this expression are derived for various limiting cases of interest. It is concluded that the magnetic field need not be taken into account in the interpretation of past observations by Bowles and by Pineo, Kraft, and Briscoe. In future experiments, however, particularly at great heights, the effect of the magnetic field could be considerable. (a-3, b-1, c-1, d-7, e-0, f-Propagation theory)

4365. HOPKINS, H. G., "Direction-Finding Experience and the Performance of Transmitting Navigational Aids," Proc. IRE, vol. 48, no. 8, pp. 1481-1482; August 1960. ABSTRACT: Comments on a recent paper by Anderson and Flint pointing out that some of the results derived in the consideration of transmitting navigational aids are in accord with what would be expected by those familiar with the corresponding direction finding analogues. The author urges that direction finding experience should not be lost sight of when considering transmitting navigational aids. (a-2, b-1, c-1, d-1, e-0, f-Discussion)

4366. MOORE, J. D., AND TRAVERS, D. N., "Shipboard Test of the Final Engineering Model of the Three-Loop Antenna on the U.S.S. Richard E. Kraus," Southwest Research Institute, Interim Development Report No. 22, Contract NObsr 64585; 26 August 1960. ABSTRACT: The date of this interim report was advanced one month to report the results of the shipboard test of the three-loop antenna. The next interim report will cover the other phases of the project for a six months' period and will be published on the normal report date of 26 October 1960. The installation of the final engineering model of the three-loop antenna on the U.S.S. Richard E. Kraus is discussed in detail. The important dimensions and characteristics of this installation are given. The condition of the three-loop antenna, modified AN/SRD-7 receiver, and the automatic calibrator equipment is described to give an understanding of the test environment. Photographs are used liberally to illustrate this point. The test procedure used to complete calibration curves is discussed in general terms, so that the methods might be applied to the description of the various test results which utilized one or more of the methods discussed. The test results indicate that the spaced-loop antenna in a typical installation, such as the one tested on the U.S.S. Kraus, yields a 2:1 improvement over the simple loop with respect to reradiation error performance. Reentrants in calibration curves are eliminated by the spaced loop. The error of this antenna is low enough to forego calibration for a large portion of the frequency range. The final engineering model of the three-loop antenna meets the sensitivity requirements established at the time its physical size was determined and overcomes the traditional objection of slow response time for a spaced loop raised by earlier workers. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4287)

4367. WATT, A. D., AND MAXWELL, E. L., "Measured Electrical Properties of Snow and Glacial Ice," J. Res. Nat. Bur. Stand., vol.

64D, no. 4, p. 357; July-August 1960. ABSTRACT: The electrical properties of snow and glacial ice near 0°C have been observed over the frequency range from 20 cycles per second to 200 kilocycles per second. In general, the conductivity of snow and glacial ice is found to be much higher than that for pure ice. This is particularly so at frequencies below 2 kilocycles per second. The magnitude of the complex conductivity for glacial ice appears to increase with temperature at frequencies below 200 cycles per second and to decrease with temperature above this frequency. (a-1, b-1, c-1, d-1, e-0, f- Experimental results)

4368. WATTS, J. M., AND DAVIES, K., "Rapid Frequency Analysis of Fading Radio Signals," J. geophys. Res., vol. 65, no. 8, p. 2295; August 1960. ABSTRACT: Examples of frequency analysis of fading radio signals for long periods of time are demonstrated, and the method of obtaining them is explained. They include both regular HF propagation and VHF ionospheric forward-scatter samples. The procedure is also useful for the analysis of other natural phenomena having long time scales and slow variations. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4369. SPENCER, R. C., "Operational Analysis of Point Source Antenna Patterns," USAF 10th Symposium on Antennas, University of Illinois, Urbana Park, Illinois: 30 August 1960. ABSTRACT: An extension of Patterson's method (1939) for studying the diffraction of x-rays from minute crystals leads to simplification of the calculation of the antenna patterns of point source arrays. The amplitude excitation F is considered to be the product of a smooth aperture function F_1 and a sampling function F_n which is unity at each of an infinite number of lattice points. If G, G_1 and G_n are the Fourier transforms of F, F_1 and F_n, then G is the convolution of G_1 and G_n, indicated by a star,

$$F = F_1 \cdot F_n \rightleftharpoons G_1 * G_n = G$$

and G is G_1 plus itself displaced to the positions of the infinite number of orders of G_n. It is assumed that overlap of adjacent orders can be neglected if, midway between orders, G_1 is down to 1% in amplitude (40 db in power). If so, the diameter of a one- or a two-dimensional array would require at least 100 points if uniformly illuminated, or 20 points if tapered to zero at the edges. Examples of linear arrays with uniform, triangular and half-cosine excitations are treated in detail, and two-dimensional arrays discussed. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4370. ANONYMOUS, "A New Approach to the Design of Ferroxcube Cores for Wide-Band H.F. Transformers," Mullard tech. Commun., vol. 5, 182-190; September 1960. ABSTRACT: The size, shape and performance of simple Ferroxcube transformer cores intended for use at low power over the frequency range 0.1 to 500 Mc/s are discussed. Optimum core proportions are calculated, and design considerations and practical examples of both wide-band and pulse transformers are given. (a-3, b-5, c-1, d-5, e-0, f-Ferrite design considerations)

4371. ANONYMOUS, "Test Plan Vulnerability Evaluation of the Vantage Point Radar (VANPAR) AN/TPD-2," Army Electronic Proving Ground, Fort Huachuca, Arizona, Report No. AEPG SIG920-168, Project No. NR3E5407 001 06; ASTIA No. AD-340 808; September 1960. ABSTRACT: This Test Plan outlines tests to evaluate under field conditions the vulnerability of the Vantage Point Radar (VANPAR), AN/TPD-2, to electronic countermeasures. The tests will provide information on the vulnerability of the radar to active electron countermeasures (jamming), its susceptibility to passive electronic countermeasures (intercept and direction finding), and will determine the degree of mutual compatibility of the AN/TPD-2 with other radar equipments. Both the area surveillance and point-search modes of operation will be used thruout the tests. (a-1, b-3, c-1, d-1, e-0, f-0)

4372. ANDERSON, W. L., BEYERS, N. J., AND RAINEY, R. J., "Comparison of Experimental with Computed Tropospheric Refraction," Trans. IRE, vol. AP-8, no. 5, pp. 456-461; September 1960. ABSTRACT: Limits of applicability of ray tracing in computing tropospheric refraction at White Sands Missile Range were further explored. 286 comparisons were made, all for a path from radar to fixed beacon of about 45 miles and an elevation angle of 17.99 milliradians. A horizontally stratified atmosphere was assumed. Refractive index profiles were prepared from a variety of weather data, and classified A, B, C, or R, in descending order of reliability prior to ray-tracing calculations. Angle observations were made with an FPS-16 C-band radar having a quoted instrumental accuracy of 0.14 milliradian rms. Angle readings varied from 18.36 to 20.54 milliradians, with mean of 19.01 milliradians and standard deviation of 0.41 milliradians. The rms deviations of computed experimental angles ranged from 0.28 to 0.41 milliradian for different classes of data. The ratio of this deviation to the deviation from over-all mean varied from 0.68 for Class A to 1.00 for Class R. Thus the improvement over a "standard atmosphere" varied from 32% to 0, and correlated directly with quality of weather information. For this experiment it is concluded that most of the rms elevation angle error is contributed by atmospheric conditions. Although ray tracing methods provide a significant correction when sufficiently good weather information is available there still remains a large uncertainty not accounted for by equipment. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4373. ANDREASEN, M. G., "Antenna Design Parameters," Stanford Research Institute, Menlo Park, California, Progress Report No. 14, Contract DA 36-039-sc-73106; ASTIA No. AD-246 314; September 1960. ABSTRACT: Three different types of omniazimuth, instantaneous direction-finding antennas that were built and tested at Sanford Research Institute for the Signal Corps are compared in detail. The construction of the 5-ft modified Purcell array at 35 kmc is continuing. The beam-broadening and beam-steering effects of several mechanical modifications of 2 narrow-beam leaky-wave antennas were computed, showing that beamwidth changes exceeding 5:1 can be obtained even with these simple modifications. Linear arrays with symmetric but variable interelement spacings were studied using both an analog computer and a digital computer. A variety of arrays were synthesized whose maximum side-lobe levels are within 1 or 2 db of the minimum theoretical levels for arrays with the corresponding number of widely spaced elements. Such arrays do not require nearly as many elements as uniformly spaced arrays to obtain a given beamwidth. The special tools required to fabricate the double-layer pillbox with a rolled back were completed. (a-1, b-3, c-1, d-1 e-140, f-Design analysis)

4374. BERBERT, J. H., "Effect of Tracking Accuracy Requirements on Design of Minitrack Satellite Tracking System," Trans. IRE, vol. I-9, no. 2, pp. 84-88; September 1960. ABSTRACT: The Minitrack Radio Tracking Network was designed by Project Vanguard engineers at the Naval Research Laboratory in Washington, D. C., and is now operated by the National Aeronautics and Space Administration. Its intended function was to acquire, and accurately track, the Vanguard satellites which were to be launched during the International Geophysical Year. To carry out this function, eleven identical stations were built in strategic locations around the world and teletype communications were established between these stations and the Vanguard orbit computer in Washington. The locations of nine of the original stations are shown in Fig. 1. The other two stations are near Johannesburg, South Africa, and Woomera, Australia. The stations use fixed beam antennas having a beam pattern at the 6-db points of 100° north-south by 11° east-west, forming a north-south fence to intercept the satellites once per orbit. The signal from the satellite is received by two antennas placed an accurately known distance apart. The received signals are then compared in phase to determine the difference in the two radio path lengths from the satellite to the two antennas. The difference in path lengths, divided by the antenna separation, equals the cosine of the angle at the station center between the baseline and the line to the satellite. This equation is an approximation for close ranges, but it is such a good one that for ranges greater than six miles the error falls below 2" of arc, and for satellite ranges the error is infinitesimally small. The two 500 foot baselines, oriented east-west and north-south, are used for the accurate angle measurements. For these baselines, the path difference changes by one 108-Mc wavelength for each 1.04° of angular change near zenith, so that the corresponding phasemeter readings repeat for approximately each square degree in the sky. The three shorter baselines tell from which square degree the satellite is radiating, and the 500-foot baselines specify where the satellite is within each square degree. (a-1, b-1, c-1, d-1, e-0, f-Description)

4375. CHIKHACHEV, B. M., "Periodic Variations of Refraction of Radio Waves in Solar Radiations," Radiotekhnika, vol. 5, no. 9, pp. 1350-1369; September 1960. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Propagation theory)

4376. EDWARDS, L. C., AND HEDLUND, D. A., "Cozi [Communication Zone Indicator] Oblique Incidence Ionospheric Soundings Using Normal Communication Transmissions," IRE Trans., vol. CS-8, no. 3, pp. 160-164; September 1960. ABSTRACT: A new technique has been developed which allows normal communication or broadcast transmissions to be used for backscatter sounding. It involves a cross-correlation performed between the transmitter signal and the returned backscatter signal. The use of re-entrant delay lines as storage devices permits continuous real-time cross-correlations of relatively long samples of the waveforms. An A-scope presentation

of the cross-correlation function serves the same purpose as an A-scope display of the backscattered pulse signal. An intensity modulated range-time display of the cross-correlation function, very similar to the range-time display commonly employed in ionospheric sounding, can provide a continuous record of skip distance variations. Samples of experimental data obtained using this technique are presented. (a-3, b-1, c-1, d-1, e-0, f-Investigation)

4377. FISCHER, H. J., "Operational Range Problems for Active and Passive Location Methods," Nachrichtentechnik, vol. 10, no. 9, pp. 401-404; September 1960. ABSTRACT: A general engineering survey of location methods is presented; passive methods rely on reflection of electromagnetic waves (λ = 1 mm to 10 m) but also of sound, infrared and X-ray waves, and use pulse or cw transmission modes. Active methods operate by detection of the target's radiation. Very brief tabulation of main technical problems is given, the following in particular: dispersion coefficient versus wavelength with reflecting object as parameter; relationship between target height and radar range; optimal aerial noise temperature versus frequency; noise performance of modern active devices, the best being masers at 10°K; block diagrams of typical devices are reproduced. The survey concludes with a brief indication of desirable improvements and developments of location systems. (a-3, b-2, c-4, d-4, e-0, f-Survey)

4378. FORBES, G. R., "An Endfire Array Continuously Proximity-Coupled to a Two-Wire Line," IRE Trans, vol. AP-8, no. 5, pp. 518-520; September 1960. ABSTRACT: An endfire array is described in which 30 $\lambda/2$ dipoles, $\lambda/4$ apart, are excited through their position transverse to a two-wire line. The coupling of element and line is discussed in terms of a simple equivalent circuit which neglects mutual coupling between elements. Measured pattern data are presented for a 600 Mc/s array which had a 25 dB taper achieved by varying the spacing of the dipoles from the line. (a-3, b-1, c-1, d-1. e-0, f-Description)

4379. FULTON, G. W., AND DE VRY, E., "Antenna Relay Modification," Central Experimental and Proving Establishment (Canada), Report No. CEPE-1528, ASTIA No. AD-321 079; September 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

4380. GILLMANN, H., "Optimum Utilization of the P P.I. Radar Display Using a Transmission System with Frequency Compression," Frequenz, vol. 14, no. 9, pp. 306-314; September 1960. ABSTRACT: The theoretical analysis is based on a conventional radial display. Radial and azimuthal resolutions are calculated in a general form assuming that the distribution of luminous intensity over the luminous spot is Gaussian. The analysis yields a "frequency response" for the radial resolution and, in consideration of the visibility of the sweeps at the edge of the display, a minimum number of spokes per revolution for the azimuthal resolution. The number of radial sweeps can be reduced by superimposing a sinusoidal sweep in the azimuthal direction. The influence of the aerial on the azimuthal resolution is also examined. (a-3, b-2, c-4, d-4, e-0, f-Theoretical analysis)

4381. HANSEN, R. C., "Gain Limitations of Large Antennas," IRE Trans., vol. AP-8, no. 5, pp. 490-495; September 1960. ABSTRACT: Arrays of many elements and continuous aperture aerials are very often designed using Taylor's "approximate" space factor which is optimum in resolution, i.e., it offers minimum beamwidth for a given sidelobe ratio. This space factor has a number of equal level sidelobes followed by tapered lobes, the latter being necessary to make the aperture function physically realizable. For conventional aerials these designs offer gain which, while not that of a uniform aperture, is quite satisfactory. Very long (or large) aerials with their narrow beamwidths, however, may exhibit a severe gain degradation due to large energy contained in the sidelobes. Thus the sidelobe behaviour must be carefully controlled to realize the full gain available. Data are presented for the gain variation of various Taylor equal-sidelobe designs, and of the modified sin x/x one-parameter family as a function of aperture length. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4382. HEISLER, L. H., AND WHITEHEAD, J. D., "F-Region Traveling Disturbances and Sporadic-E Ionisation," J. geophys. Res., vol. 65, no. 9, p. 2767; September 1960. ABSTRACT: Ionosonde records taken at Sydney (33°52'S, 151°11'E) during July 1955 have been analyzed statistically for the occurrence of F-region traveling ionospheric disturbances and E_s. It is shown beyond reasonable doubt that the phenomena are associated, and that, as previously suggested by one of the authors, the advent of a traveling ionospheric disturbance is sometimes accompanied by an increase in E_s critical frequency. An apparent small secondary effect in E_s occurring some minutes after the F anomaly is also discussed. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4383. KATTNER, G., AND ROHRBECK, W., "Calibration Problem in Double-Channel Visual Direction Finders," Nachrichtentechnik, vol. 10, no. 9, pp. 392-397; September 1960. ABSTRACT: A discussion of various methods for the calibration and control. It is shown that all calibration procedures requiring that the equipment be interrupted in operation have a common disadvantage in that, during the direction-finding, changes of the gain constants of the channels would be made unintentionally by the operator. It is preferable, in the interest of greater reliability, to use methods employing continuous control; for current calibration of the receiver this control should extend to the screen of the crt. A method in which the receiver channels are periodically interchanged offers almost complete safety; it has, however, a considerable disadvantage in respect of interference-free monitoring. A scheme offering the best possible solution with low cost and greater reliability is suggested. (a-2, b-2, c-4, d-4, e-515, f-Discussion)

4384. KATZIN, M., "Radio Distance Measurement and Position Fixing. A Survey and Evaluation of Techniques and Systems," Electromagnetic Research Corporation, College Park, Maryland, ASTIA No. AD-253 111; September 1960. ABSTRACT: This paper gives a survey and discussion of radio methods of distance measurement and position fixing, a general discussion of the important propagation characteristics and accuracy of radio wave methods, followed by a classification of systems and the advantages and disadvantages of radio methods. Also included is a description of various specific systems in use or under development, the types of application to which each is adapted, the range and accuracy already achieved and the limitations imposed by various factors, especially inherent propagation characteristics. (a-1, b-3, c-1, d-1, e-0, f-Survey and evaluation)

4385. KELLY, D., AND MARGENAU, H., "High-Frequency Breakdown of Air," J. appl. Phys., vol. 31, no. 9, pp. 1617-1620; September 1960. ABSTRACT: Kinetic theory is applied to the problem of ionization breakdown of the air surrounding a high-speed vehicle. It is found that electrons are removed primarily by being swept out of the field of the moving aerial, and that in the interesting cases this action predominates over diffusion losses. Breakdown voltages are plotted against altitude for frequencies of 225 Mc/s, and 1 and 10 kMc/s. The theory may offer an explanation of some types of signal loss during missile flights. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4386. REHAHN, J. P., "Techniques of Radio-Direction Finders," Nachrichtentechnik, vol. 10, no. 9, pp. 382-391; September 1960. ABSTRACT: A review of common direction-finding equipment and operating techniques. Various equipments are described in a systematic way with reference to the direction-dependent modulation comprising periodic and non-periodic amplitude and phase modulation. In the description of the practical equipment only the more important properties are discussed. (a-2, b-2, c-4, d-4, e-0, f-Survey)

4387. SHANKS, H. E., "A Geometrical Optics Method of Pattern Synthesis for Linear Arrays," IRE Trans., vol. AP-8, no. 5, pp. 485-490; September 1960. ABSTRACT: A unique phase expression is given which allows synthesis of a wide variety of shaped radiation patterns for a linear array. The accompanying amplitude distribution is found by a stationary phase evaluation of the radiation integral and is shown to be functionally related to the desired radiation pattern. Because of the optical type of approximation (stationary phase) used to evaluate the radiation integral, the method is most applicable to aerials with large size-to-wavelength ratios. (a-3, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4388. STEINER, F., "Wide-Base Doppler Very-High-Frequency Direction Finder," IRE Trans., vol. ANE-7, no. 3, pp. 98-105; September 1960. ABSTRACT: Although it is quite well known that bearing errors occurring with multipath propagation can be reduced by using widebase aerial arrays, only systems operating with phase or frequency modulation have come into practical use. A method of progressively scanning a circular aerial array is described. The scanning which produces a frequency modulation in which the frequency deviation is a function of the bearing information, is accomplished by a rotating capacitive switch, and no vacuum tubes or crystal diodes are employed. Moreover, a special light indicator replaces the usual cathode-ray tube. Designed primarily for the very- and ultra-high frequencies, the equipment is quite simple and of high reliability. (a 1, b-1, c-1, d-1, e-426, f-Description)

4389. TRAVERS, D. N., AND SHERRILL, W. M., "Direction Finding in a Two-Component Field," IRE Trans., vol. AP-8, no. 5, pp. 520-521; September 1960. ABSTRACT: An earlier method of analyzing the components, of different azimuth, amplitude and phase, due to direct and reradiated signals is referred to. This method required a two-channel receiver. It is shown that the same result may be obtained using a spinning loop aerial or crossed loops and a goniometer with a single channel receiver. (a-2, b-1, c-1, d-1, e-355, f-Descriptive analysis)

4390. WALTER, C. H., "Surface-Wave Luneberg Lens Antennas," Trans. IRE, vol. AP-8, no. 5, pp. 508-515; September 1960. ABSTRACT: It is demonstrated that a surface-wave structure having isotropy in the plane of the structure can be operated as a lens. The index of refraction is given for a dielectric slab on a ground plane, a bed of metal posts on a ground plane and a parallel-plate structure with one plate filled with holes. The necessary radial variations in index for several Luneberg-type lenses are given. These include the conventional Luneberg lens, Gutman's modification, the rim-fed Luneberg adapted to a spherical surface and a modification adapted to a spherical surface and collimation of the rays at an arbitrary angle with respect to the plane on which the lens is mounted. An approximate analysis of surface-wave lenses based on optics is described. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4391. WILLOUGHBY, E. O., "Launching over the Sea of Vertically Polarised Waves for Long Distance Ionospheric Propagation," Proc IRE, Australia, vol. 21, no. 9, pp. 591-597; September 1960. ABSTRACT: Simple vertically polarized aerials of mast heights of 150 feet or less, launching over the sea are shown to be capable of gains exceeding 14 dB over a frequency band of the order of 5-15 Mc/s with good matching and efficient radiation between 1° and 10° elevation. This is much superior to what can be achieved with any land-based aerial, vertically or horizontally polarized, of similar height. (a-3, b-1, c-1, d-11, e-0, f-Analysis)

4392. TRAVERS, D. N., "A New Shipboard Direction Finding Antenna for the Reduction of Reradiation Error," Southwest Research Institute, Interim Report No. 23, Contract NObsr 64585; 1 September 1960. ABSTRACT: High frequency shipboard radio direction finding has always been difficult to accomplish with accuracy and reliability because of reradiation from the vertical masts and structures found on Naval ships. Various attempts to find an accurate method of direction finding under such conditions have been made but with little success until recently. The development of a new antenna based on the coaxial spaced loop is traced from its concept about 1955 to the present time including a performance test made on board the U.S.S. Richard E. Kraus. Results show that multivalued calibration data is eliminated and error is low enough to forego calibration entirely for a large portion of the frequency range. (a-1, b-3, c-1, d-1, e-1000, f-Interim report)

4393. HENNIES, S. R., AND GRANGER, J. V. N., "Broad-Band Frequency-Scanning Radar System," Electronics, vol. 33, no. 36, pp. 44-47; 2 September 1960. ABSTRACT: Describes with the aid of block schematics a radar system which sequentially scans seven frequencies in the 6 to 50 Mc/s band at 60 frequencies per second, and operates on a coherent basis in providing Doppler data on each frequency. Peak power is 15 kW. The phase-path display enables an accurate determination of target velocity to be made, and when scanning ionized clouds the diffusion rate may be determined. (a-3, b-2, c-1, -1, e-0, f-Description)

4394. ORSAK, L. E., AND MARTIN, D. W., "Direction Finding at Low Frequencies," Electronics, vol. 33, no. 38, pp. 74-77; 16 September 1960. ABSTRACT: Description of a direction finder operating between 15 and 500 kc/s using a small rotating aerial with only 4 ft^2 of loop area and having a sensitivity of 1 uV/m at 500 kc/s and 40 uV/m at 15 kc/s. Instrument error is less than 1°. The design of the loop aerial coupling circuits, automatic tuning, etc., are discussed in detail. A novel feature is the use of two photocells in simple circuitry to resolve an eight-to-one ambiguity introduced by the gearing in the position indication system. Block diagrams are given. (a-2, b-2, c-1, d-1, e-0, f-Description)

4395. ROESCHLEIN, E. R., "Mapping Caves Magnetically," Electronics, vol. 33, no. 39, p. 61; 23 September 1960. ABSTRACT: Describes a transistorised 5 W, 2 kc/s transmitter feeding a tuned loop which is located underground. The magnetic induction field is picked up at the surface by a similar tuned loop which feeds a transistorized receiver. The range of this transmitter-receiver is approximately 400 ft. Mapping is by null location and depth measurement by signal attenuation. (a-3, b-2, c-1, d-1, e-0, f-Description)

4396. SMYTH, H. R., "Microwave Position-Fixing System," Coast Guard, Washington, D.C., Report No. 9-7-2, ASTIA No. AD-242 151, 26 September 1960. ABSTRACT: A paper presented by H. R. Smyth, National Research Council of Canada, at the Sixth International Technical Conference on Lighthouses and Other Aids to Navigation, Washington, D.C., September-October 1960, and also presented at the Symposium of the International Geodetic Association held at Washington, D.C., May 5-12, 1959. (a-3, b-3, c-1, d-1, e-0, f-Description)

4397. HAASE, H. J., "Direction Finders Aboard Aids-to-Navigation Vessels Operated by the Government of the German Federal Republic," Coast Guard, Washington, D.C., Report No. 9-1-6, ASTIA No. AD-242 124, 26 September 1960. ABSTRACT: A paper presented at the Sixth International Technical Conference on Lighthouses and Other Aids to Navigation, Washington, D.C., September-October 1960. (a-4, b-3, c-1, d-1, e-0, f-Survey)

4398. HOOD, A. D., "A Transistorized Buoy Transmitter," Coast Guard, Washington, D.C., Report No. 9-1-7, ASTIA No. AD-242 125; September 1960. ABSTRACT: A low power, crystal controlled, transistorized transmitter is described. The transmitter was designed for installation on off-shore buoys and may be used as a D.V. signal in a local area or for telemetering information ashore from associated equipment. The operating frequency is in the 4 mc region and with a 9 ft. centre-loaded vertical antenna strong signals are received at a range of seven miles. (a-1, b-3, c-1, d-1, e-0, f-Description)

4399. AWCOCK, R. L. J., AND PARKER, F. J., "An Automatic Marine Direction Finder for Use with M. F. Radio Beacons," Coast Guard, Washington, D.C., Report No. 9-1-1, ASTIA No. AD-242 119, 26 September 1960. ABSTRACT: Research is concerned with the design of an automatic direction finder specifically for shipborne use. The equipment covers the frequency range 250-550 kc and therefore includes the M.F. radio-beacon band and the M.F. ship distress frequency. Automatic operation is achieved by the use of a powerful system of automatic gain control in the receiver, plus an automatic servo drive operating on a self-contained radio-goniometer. (a-1, b-3, c-1, d-1, e-0, f-Description of equipment)

4400. ANONYMOUS, "Direction Finder for Small Craft," Engineer, vol. 210, p. 565; 30 September 1960. ABSTRACT: A portable direction-finding receiver which offers in one case all the facilities of a ship's installation has been developed by Pye, Ltd., Cambridge. It is claimed that with the Pye "Solent," seen in our illustration, accurate D/F bearings can be taken from radio beacons on the long wave beacon band. Sensitivity and selectivity compare favourably with that of fixed installations and the company states that extensive trails have shown that bearings can be taken to an accuracy of plus or minus 1 deg. The receiver employs nine transistors and works off eight standard 1-1/2 V torch batteries and these items together with printed circuitry make the unit light, portable and robust. A signal strength meter, which is also used for checking battery strength, gives visual indication of signals when direction- and sense-finding, and thus gives greater accuracy than the usual audible method. The D/F aerial, which uses a ferrite rod, is mounted together with a compass rose on top of the receiver case, while the signal strength meter, full vision dial and other controls are mounted on the front panel. There are two sockets, one for headphones and the other, on the aerial housing, to take an external aerial for sense finding. This also increases the range on the shipping band. A beat frequency oscillator is incorporated so that the "Consol" method may be used for long range navigation. In addition to the long wave beacon band the "Solent" covers the medium-short wave trawler band and there is an 8 in. elliptical loudspeaker designed to work in conjunction with transistor circuits. The battery life is approximately three months if used for two hours per day. (a-1, b-2, c-1, d-5, e-0, f-Description)

4401. ARCHBALD, R., HOFFMAN, D., ET AL., "Special Purpose Analysis Techniques," New York University, College of Engineering, Quarterly Report No. 1, Contract No. DA 36-039-sc-84968, ASTIA No. AD-249 586; September 1960. ABSTRACT: Feasibility studies are being conducted to determine optimum techniques for analyzing, displaying, and/or identifying signals received by countermeasure receivers. The investigation is directed toward the design of equipment to assist the operator in the analysis and/or identification of special signals. The development of an automatic direction finding system initiated under Contract No. DA-36-039-sc-74990 is continued. An analysis is presented of the errors which may be attributed to an antenna

used in the system. A description is given of an antenna currently being tested. A study started under Contract No. DA 36-039-sc-74883 for utilizing a small general purpose digital computer in signal analysis is continued. Also presented is a development of a photographic recording technique for digital signal data, a discussion of computer input data rate required and of computer operation in conjunction with a crystal video receiver, a description of methods for filtering the signal environment, a review of the detection of pulse signals in noise, and a consideration of the effect of noise on the computer analysis program. (a-1, b-3, c-1, d-1, e-0, f-Progress report on investigation)

4402. DESTEFANO, J., "Direction Finder Group OA-(XE-1)/VRD," Litton Systems, Incorporated, College Park, Maryland, Progress Report No. 1, ASTIA No. AD-246 748; September 1960. ABSTRACT: Research is concerned with the design, development and fabrication of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearings of electromagnetic signals in the frequency range of 1.0 kmc to 10.75 kmc. The primary portion of the group consists of an antenna, high speed pedestal, memory type CRT indicator and servo control unit. A second pedestal will be provided to support and rotate the following units. (1) Antenna Assembly AN/TLA-( ), (2) A four foot parabolic reflector and feed assembly, or (3) any antenna assembly, with a maximum weight of 75 pounds. The final design plan of the program has been submitted for approval and negotiations are presently under way for an antenna assembly and radome. Final design of the pedestals has begun. The Control Indicator Unit is in the breadboard design stage, with all circuits operating satisfactorily. The unit is composed of the following major systems: video processing, memory cathode ray tube and control, high voltage power supplies, video resolver and deflection system, video resolver servo system, and an azimuth control servo system. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4403. WHEELER, W. R., "Research on New Types of ECM and DF Aircraft Antenna Systems for the Frequency Range 50 - 1000 Mc. (U)," Denver Research Institute, Final Progress Report, 7 November 1959-31 August 1960, ASTIA No. AD-320 158; 30 September 1960. ABSTRACT: Research is reported on new types of ECM and D/F aircraft antenna systems. A broad band slotted cylinder antenna is described. A method of theoretical analysis of this antenna is presented. Pattern and impedance data for dielectric coated slotted cylinder antennas show that patterns are little affected by thin dielectric coatings but impedances are changed both in magnitude and phase. A theoretical and an experimental pattern for a dielectric coated slotted cylinder antenna are compared. (a-1, b-3, c-1, d-1, e-0, f-Research report)

4404. BARON, A., BLANK, S., ET AL., "Emitter-Location Techniques," Airborne Instruments Laboratories, Inc., Long Island, New York, Quarterly Engineering Report No. 5844-I-9, ASTIA No. AD-320 294; October 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4405. BEDNASH, C.S., CLIFFORD, V.F., ET AL., "Improved HF/MF Direction Finder Set," ITT Federal Labs., Nutley, New Jersey, Final Report, Contract No. DA 36-039-sc-78079, ASTIA No. AD-266 357; October 1960. ABSTRACT: The design and fabrication of an improved direction finder set operating in the frequency range of 0.54 to 30 mc is described. The specified method of approach called for modification of existing components of direction finder set AN/TRD-4A to meet improved performance requirements. The work consisted mainly of modifications to the antenna system, goniometers, goniometer drive, and visual azimuth indicator, as well as providing a facility for semi-automatic bearing readout, and adding a second D/F operating position. In addition, console type operating positions were substituted for the standard rack type, and the target transmitter was redesigned. A discussion is included of the operation and final testing of the improved HF-MF direction finder set. (a-1, b-3, c-1, d-1, e-0, f-Equipment description)

4406. BENNINGTON, T.W., "Equatorial Ionospheric Effects. Post-Sunset Fading on Long-Distance Radio Circuits," Wireless World, vol. 66, no. 10, pp. 501-506; October 1960. ABSTRACT: In a region near the earth's magnetic equator there occur several magnetic and ionospheric phenomena which appear to be peculiar to that region alone. One of these is an effect which occurs in the F2 layer of the ionosphere soon after local sunset, and which appears to last for a few hours thereafter. Because the echoes obtained from that layer by vertical sounding become, during these hours, diffuse and of indefinite height, it is known as "equatorial spread F." In 1938 Booker and Wells reported that at Huancayo, Peru, there was, soon after sunset, a marked increase in the height of the F region and that the received echoes then became diffuse, as though they were due to scattering from electronic clouds, rather than due to reflection from a stratified layer. Later in the night there was a decrease in the height, accompanied by a disappearance of the diffuse echoes. In 1951 Osborne observed a similar phenomenon at Singapore, which, like Huancayo, has a low dip latitude. He stated that soon after local ground sunset the F2 layer virtual height rapidly increased, and the region, instead of preserving its layer-like structure, began to form "cloud" of ionization and that, by the time of ionospheric sunset, it frequently disintegrated entirely into such clouds. Soon after this the virtual height began to decrease again and, though the clouds often persisted for several hours, the layer gradually regained its normal structure. Short-wave engineers soon came to associate these ionospheric occurrences with a peculiar fading of the signals received over trans-equatorial circuits soon after local sunset, and which they called the "tropical sunset fading effect." This was noticed at Singapore, in many parts of Africa and at several other locations, and observations made over several years have established the following general facts about it. The fading appears to occur more frequently at the equinoxes than at other times of year, though it does occur during other than equinoctial months. At most places where it has been observed it starts soon after local ground sunset and lasts for about four hours, after which conditions return to normal. (As we shall see there are exceptions to this.) It is generally worse during years of high than of low sunspot activity and appears to be brought about by conditions in the ionosphere in a zone lying near the magnetic equator, the northern and southern boundaries of which are not yet known. The fading is of medium or deep intensity, is at a rapid rate and often of the kind known as "flutter" fading. Such fading can be of serious consequence in various types of communication, for receiver a.g.c. systems do not deal with it effectively. In high-speed telegraphy the resulting distortion of the characters conveying the transmitted information often renders the received result unintelligible. In broadcasting, whilst speech usually remains intelligible, the fast fading destroys the programme value of music transmission. (a-1, b-2, c-1, d-5, e-0, f-Analysis)

4407. BROUSSAUD, G., AND SPITZ, E., "Superdirectivity. Supergain," Ann. Radioelect., vol. 15, pp. 289-304; October 1960. ABSTRACT: Gives a theoretical discussion of the maximum directivity which can be obtained with an aerial of given dimensions, the conclusions indicating that the attainment of high directivity depends on the generation of a large reactive field in the output aperture by means of a distribution of independent sources spaced less than half a wavelength apart. Experimentally it has been found necessary to add a unidirectional element in front of each source in order to achieve these conditions. Experimental results are quoted relating to five- and eleven-element aerials operating in the 9 Gc/s band which achieve high directivity while maintaining a low side-lobe level and acceptable pass band. (a-3, b-1, c-3, d-3, e-0, f-Theory)

4408. DRABOWITCH, S., "Some Applications of Signal Theory to Aerials," Rev. tech. C.F.T.H., No. 33, pp. 7-27; October 1960. See also Trans. I.R.E., vol. VC-9, no. 3, pp. 1-9; December 1960. ABSTRACT: Several techniques for reducing the effect of impulse noise with a peak amplitude greater than that of the signal and generally with a substantially shorter duration than that of the shortest important message element are analysed. The techniques utilise the fact that the impulse response of a linear filter is directly proportional to its bandwidth. One circuit described uses two parallel amplifiers tuned to the same centre frequency, one of gain G, bandwidth B, the other of gain gB and bandwidth B/b. The outputs of the two amplifiers are subtracted when the theoretical signal/noise ratio can be improved by 8.28dB for b = .91. No experimental results are included. (a-3, b-1, c-3 and 1, d-3, e-0, f-Descriptive analysis)

4409. KATZ, I., AND SPETNER, L.M., "Polarization and Depression-Angle Dependence of Radar Terrain Return," J. Res. Nat. Bur. Stand., vol. 64D, no. 5, pp. 483-486; September-October 1960. ABSTRACT: A study of recent experimental results on radar back scattering from land and sea surfaces indicate: (a) The polarization dependence of the normalized radar cross section, σ_0, of ocean surfaces cannot be explained by the usual "interference phenomenon," and (b) there is a distinct difference in the form of the depression-angle dependence in that σ_0 for "smooth" surfaces follows a negative exponential whereas σ_0 for "rough" surfaces drops off as the sine of the depression angle. (a-1, b-1, c-1, d-1, e-0, f-Study)

4410. KLEMPERER, W.K., "A Study of Spread F," Cornell Aeronautical Lab., Inc., Buffalo, New York, Final Report, Contract No. AF 19(604)5460, AFCRL-243, ASTIA No. AD-255 188; October 1960. ABSTRACT: A study was made of high frequency radar reflections from the ionosphere. Of primary interest was the study of spread F (a night-time echoing condition giving diffuse radar returns over a

considerable range interval). A scheme for determining the spread in angle of arrival of radio waves under spread F conditions was devised, and a few measurements were made. In addition, information about the nature of reflection and scattering from the ionosphere during spread F was obtained by analysis of probability density distributions and power spectra. In conjunction with a radio astronomy program at Cornell University, simultaneous data were taken to relate the occurrence of spread F with radio star scintillation. A marked positive correlation between the two events was observed. Equipment for determining ionospheric drift velocities during spread F was installed and theoretical work on the subject of scattering near the level of reflection in the ionosphere was initiated. (a-1, b-3, c-1, d-1, e-0, f-Study report)

4411. KOVIT, B., "Commutated-Antenna DF Meets Civil and Military Needs," Space/Aeronautics, vol. 34, pp. 223-225; October 1960. ABSTRACT: A wide-aperture direction finder, produced by Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London W.C.2, England, and the parent company, International Telephone & Telegraph Corp., Nutley, N.J., in this country, cuts site and horizontal polarization error factors of at least 8 and 3, respectively. Basically, the automatic D/F consists of a circular array of antenna elements that are electronically commutated and fed into a central receiver. Unlike single receiver Doppler-type D/Fs, STCs uses a dual receiver with a common local oscillator. The second receiver channel accepts a reference signal from a fixed auxiliary antenna. The system samples the signal input from the commutated array at a one-millisecond rate and detects the phase difference in the modulated envelope seen by adjacent antenna elements. Phase demodulation is done with a novel electronic multiplier that compares the output wave of a 180-deg linear phase detector with two orthogonal fixed reference waveforms. An air transportable version combines 18-element VHF and UFH antenna arrays and gives simultaneous service on two separate D/F channels. The D/F could also be used for position fixing by triangulation (two D/Fs in tandem). (a-1, b-2, c-1, d-1, e-0, f-Description)

4412. PRIEDIGKEIT, J.H., AND ELPEL, E.A., "Position-Location Network Study," First Quarterly Progress Report under U.S. Army Electronics Research and Development Laboratory (formerly U.S. Army Signal Research and Development Laboratory), Contract No. DA-36-039-sc-84966; October 1960 (subsequent reports issued). ABSTRACT: A series of reports describing the development of techniques and equipment for an automated tactical direction finding system utilizing the AN/TRD-4A high frequency direction finders. (a-4, b-3, c-1, d-1, e-505, 511, 593, 618, 645, 646, some not available, f-Exper ment)

4413. SARAN, G.S., AND HELD, G., "Field Strength Measurements in Fresh Water," J. Res. Nat. Bur. Stand., vol. 64D, no. 5, p. 435; September-October 1960. ABSTRACT: Experiments were performed to measure field strength at a frequency of 18.6 kilocycles per second in fresh water of conductivity 2.66×10^{-3} mhos/meter down to depths of 1,000 feet using monopole and loop antennas. The experimental results verify the theoretical values of field strength attunuation with depth for all antennas and of the ratio of vertical to horizontal field strength for the monopole antennas. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4414. SKLAR, H., "An Improved Method for Airborne Direction-Finding in the VHF-UHF Range," 10th Annual Symposium on USAF Antenna Research and Development, University of Illinois, sponsored by Wright Air Development Division, Wright-Patterson AFB, Ohio; October 1960. ABSTRACT: Direction-finding systems in the VHF-UHF range are subject to large bearing errors due to antenna pattern distortions caused by airframe scattering. This paper describes a study presently under way of a technique for minimizing these bearing errors while at the same time presenting the bearing data in digital form. The technique is essentially that of building an ideal detector that will operate on the incoming signal in such a way as to reduce the bearing errors to a minimum when averaged over the significant variables of the system. Present day airborne D/F antennas in the frequency of about 300 to 1000 Mc are of the dipole class. That is to say their dimensions are of the order of a wavelength and their beam widths of the order of 60 degrees. These antennas are mounted below the airplane and rotated at rates of around 300 rpm. (Some of the newer D/F antenna systems have much higher rotation rates.) The outputs of these antennas are presented on the face of an oscilloscope having a circular trace so that the pattern appearing on the scope for the case of negligible scattering is the free-space pattern of the antenna. The pattern maximum is in the direction of signal arrival which is called the true bearing angle. When scattering is not negligible, the pattern appearing on the scope becomes distorted and its maximum in general no longer coincides with the true bearing angle. Conventional D/F techniques take the direction of signal arrival to be either the maximum of the scope pattern or the point midway between its half-power points. This results in bearing errors which for an unusually bad pattern are very large. In the more usual cases, bearing errors will run between about 5 and 10 degrees. (a-1, b-3, c-1, d-1, e-0, f-Descriptive survey)

4415. WATT, A.D., "ELF Electric Fields from Thunderstorms," J. Res. Nat. Bur. Stand., vol. 64D, no. 5, p. 425; September-October 1960. ABSTRACT: The varying electromagnetic fields produced by thunderstorms and associated lightning discharges are examined. Calculated field variations produced by an assumed typical cloud to ground discharge model are found to agree well with observed fields. The magnitude of these vertical electric field changes are observed to decrease very slowly with distance from the source for values comparable to discharge channel heights. From 4 to 20 kilometers a $1/d^3$ relation is observed, and beyond 30 kilometers the field variations appear to follow a 1/d relation. The expected radiation field frequency spectra from 1 cycle per second to 100 kilocycles per second are calculated employing models assumed to be typical of "long" and "short" discharges. The radiation spectra obtained from 1 to 100 kilocycles per second for observed cloud to ground discharge field variations normalized to 1 kilometer are seen to agree within expected limits with calculated values. The models employed indicate that below 300 cycles per second "long" discharges produce much more energy than "short" discharges, and that inter- and intra-cloud discharges may produce as much energy as cloud to ground discharges. Anticipated variations of total vertical electric field frequency spectra as a function of distance, based on the work of Wait, are shown for the frequency range from 1 cycle per second to 100 kilocycles per second. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4416. WILSON, A.C., "High-Gain, Very Low Side-Lobe Antenna with Capability for Beam Slewing," J. Res. Nat. Bur. Stand., vol. 64D, no. 5, p. 557; September-October 1960. ABSTRACT: A corner-reflector antenna having reflecting surfaces ten wavelengths wide and two wavelengths long was constructed, adjusted, and tested. The driver element was a collinear array of ten half-wave dipoles. Dolph-Chebyshev current distribution designed for side-lobe suppressions to −45 decibels was computed. The currents in the dipoles were adjusted as nearly as possible to this distribution. The phase of the dipole currents was graded so as to slew the main beam 10° off the forward direction. The radiation patterns were measured and found to be quite close to the computed. Check of pattern stability with time and with changes in temperature and weather conditions showed it to be quite stable. Measurements of radiation pattern at frequencies departing from design frequency showed the operating bandwidth (determined by the preservation of the pattern) to be adequate for the applications likely to be considered for such antennas. The half-power beam widths of the main lobe were 9.8° in the E-plane and 32° in the H-plane. On the basis of the measured beamwidths, the gain was calculated to be approximately 21.2 decibels relative to an isotropic radiator. The gain was experimentally measured to be 21.2 decibels. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4417. MC DONALD, J., AND CONFALONE, J., "Electronic Reconnaissance Set," Airborne Instruments Labs., Mineola, New York, Quarterly Report Nos. 14 and 15, Contract No. AF 33(604)14319, ASTIA No. AD-320 281; 1 October 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4283)

4418. RICHRATH, W., "Receiving System Countermeasures, VLF," A.R.F. Products, Inc., River Forest, Illinois, Interim Engineering Report No. 15, Contract NObsr 77636, ASTIA No. AD-322 264L; 7 October 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4333)

4419. MC LEISH, C.W., AND BURTNYK, N., "Radio Direction Finding with a Twin-Channel Receiver," Proc. NEC, p. 157; 10 October 1960. ABSTRACT: The elements of direction finding with a twin-channel receiver are reviewed briefly. The channel matching design problem for a specific equipment working in the HF band is described. Over-all performance figures are given for the instrument and for the system as a whole when used on a conventional direction finding antenna. Some results obtained on an interferometer are presented to illustrate other applications of the twin-channel system. (a-1, b-1, c-1, d-1, e-0, f-Description and analysis)

4420. RICHTER, F.G., AND ROCK, P., "Radio Direction Finder Set AN/BRD-4," Servo Corporation of America, Long Island, New York, Interim Development Report, Contract NObsr 81281, ASTIA

No. AD-322 936L; 14 October 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4421. FEINMAN, G., "Radio Receiver for Direction Finder Set AN/PRD-5," Andrea Radio Corporation, Long Island City, New York, Final Technical Report, Contract No. DA 36-039-sc-78076, ASTIA No. AD-266 250L, 15 October 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4422. LEVIS, C.A., "Preliminary Evaluation of Some Radio Location Techniques for the Very Low and Low Frequency Range," Ohio State University Research Foundation, Antenna Lab. Report No. 1075-3, Contract No. AF 30(602)2214, RADC TN 61-32, ASTIA No. AD-322 482; 15 October 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4423. TRAVERS, D.N., AND MOORE, J.D., "The Design and Construction of a three-Loop Antenna for High Frequency Shipboard Direction Finding," Southwest Research Institute, San Antonio, Texas, Task Summary Report No. VI, Contract NObsr-85086; 26 October 1960. ABSTRACT: The development and evaluation of the three-loop antenna is outlined by the references. The purpose of this report is to outline the major engineering problems in the design of a high frequency three-loop antenna. The final engineering model of the SwRI three-loop antenna is used as an example of the methods used to solve these problems. The general operational characteristics of the three-loop antenna for the spaced loop, three-loop, and simple loop modes between 2 and 32 mc are explained. The operation of the developed system with the simple loop as the primary D/F antenna below 2 mc is briefly mentioned. Each major engineering problem is considered beginning with the rotating antenna assembly where the coaxial spaced loop is a special design problem. The electrostatic shield is discussed with emphasis on critical design criteria. The requirements for the rotary coupling transformer, tuning networks, and amplifiers are discussed. The two channels from the spaced loop and simple loop must each be balanced and tracked accurately with respect to phase. Isolation between the two channels is essential. The field test configuration at SwRI is described. The principals of this configuration were applied to installation of the antenna on the U.S.S. Kraus for the shipboard test. The importance of the shipboard installation of the three-loop antenna with respect to the reradiation error performance of the three-loop antenna is discussed in detail. (a-1, b-3, c-1, d-1, e-1000, f-Development report)

4424. ANONYMOUS, "Direction Finder Checks Azimuth with Simulated Doppler Effect," Machine Design, vol. 32, pp. 134-136; 27 October 1960. ABSTRACT: Illusion of motion of receiving antenna is created in a new radio direction-finding station by scanning leads from three or four antennae in rapid succession. The resulting "doppler" effect helps locate the azimuth of incoming signals. Dipole antennae are arranged in a circle at the ends of radiating supporting arms. Leads pass down through a hollow mast. System is scanned by a commutator with five capacitive contacts so arranged that as the rotor progresses it makes three successive forward contact steps followed by two steps back for a net advance of one contact. Up to ten airports can use a centrally located station by installing duplicate read-out units and appropriate quadrant error correcting equipment. Receiving equipment for direction finding can operate either on AM or FM signals. For clarity, only two channels are shown in the diagram. Input bearing signal is combined with a station-generated reference signal by wattmeters to operate the readout device. What looks at first like an oscilloscope face is really a ground-glass screen on which is projected a point of light. Mirrors rotated by the wattmeters position the point of light. Doppler direction finder is a development of Standard Elektrik Lorenz AG, Stuttgart, Germany. (a-1, b-2, c-1, d-1, e-0, f-Description)

4425. FALNES, P., "Radio Direction-Finding at Norwegian Coastal Radio Stations," Tekn. Ukeblad, vol. 107, no. 39, pp. 877-883; 27 October 1960. ABSTRACT: A historical review is given of rdf systems and other radio navigation systems used in Norwegian coastal waters over the past 40 years. The main discussion concerns short-based D/F stations working in conjunction with coastal radio stations in the medium-frequency (telegraphy and telephony) bands. An experimental Adcock double-channel aerial system working in the 255-535 and 1600-3200 kc/s bands is described in greater detail. (a-2, b-1, c-8, d-21, e-0, f-Historical review)

4426. BAILEY, A. D., ET AL., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," Electrical Engineering Research Laboratory, University of Illinois, Quarterly Progress Report No. 5; 1 July-30 September 1960. ASTIA No. AD-250 674; 31 October 1960. ABSTRACT: Effort was continued on studies and investigations leading to the design of a radio direction finder system for the MF-HF-VHF range. Construction of one pulse modulator for the propagation experiments, and certain components of MF/HF radio direction finder systems was completed. The results of the SADIST wave interference error study are presented in the form of curves. Progress was made in the realization of an antenna for the VHF/UHF radio direction finder system. Development work on the panoramic radio direction finder system was continued. Development of an RDF using phase lock oscillators was started. (a-1, b-3, c-1, d-1, e-640, f-Study report. See Abstract No. 4313)

4427. ANONYMOUS, "Antenna Group for Direction Finder Set AN/PRD-5( )," Systems, Incorporated, Orlando, Florida, Interim Report, Period: 1 July 1959 - 30 June 1960, Contract No. DA 36-039-sc-78352, ASTIA No. AD-246 192L; November 1960. ABSTRACT: This is one volume report with the following descriptors: Direction-Finding, Antennas, Remote Control Systems, Azimuth, Loop Antennas, Design, and Sensitivity. (a-4, b-3, c-1, d-1, e-0, f-Test)

4428. FULTON, G. W., "Evaluation of Modification to UHF Direction Finding AN/CRD-6 Telecommunications Equipment," Central Experimental and Proving Establishment (CEPE) Report No. 1529, ASTIA No. AD-252 005; November 1960. ABSTRACT: The evaluation of the modification to the UHF automatic direction finding equipment AN/CRD-6 was carried out by CEPE under the authority of AMC Equipment Project 60/54. The change of bearing response time for the AN/CRD-6 phase meter (bearing indicator) is too slow in handling modern high speed aircraft. On the other hand the FTL14 bearing indicator has an almost instantaneous response time. The project evaluated the feasibility of combining the AN/CRD-6 system and the FTL14 system to give the UHF capabilities of the former and the fast bearing response time of the latter. The tests fell into three main categories; determining that the modified ADF system was feasible, that the bearing accuracy of the CRD-6 was not degraded, and that the hybrid system presented no undue mechanical or electrical problems. The results of these tests are presented as graphs of bearing errors versus bearings, table of voltages, ranges, direction of rotation of antenna and indicator, and other pertinent data, plus figures showing methods of integrating the CRD-6 and FTL14 components. In general the tests proved that the modification is feasible and worthwhile No difficulties were encountered in combining the systems and no degradation of bearing accuracies was found. The adoption of this modification is recommended for operational use in the RCAF. (a-1, b-3, c-1, d-7, e-964, f-Evaluation report)

4429. GODDARD, E. G., ELPEL, E. A., AND PRIEDIGKEIT, J. H., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Progress Report, Contract DA 36-039-sc-84966, ASTIA No. AD-253 924; November 1960. ABSTRACT: Four task areas were established on a program whose objective is to lay a foundation for the development of an automated tactical radio-direction-finding system. These task areas are (1) investigation of remote tuning of network receivers R-390/URR, (2) investigation of semiautomatic bearing read-out, bearing evaluation and transmission, (3) investigation of field-data evaluation and processing techniques, and (4) over-all system study and planning. The major effort was devoted to the remote-tuning investigation and to a study of the over-all system. The preliminary design for the automatic tuning portion of the network was nearly completed. (a-1, b-3, c-1, d-1, e-0, f-Report See Abstract No. 4412)

4430. HAKURA, Y., "Polar Cap Blackout and Auroral Zone Blackout," J. Radio Res. Lab. (Japan), vol. 7, pp. 583-597 November 1960. ABSTRACT: Characteristic patterns of both polar-cap and auroral-zone blackouts were obtained by statistical analysis of ten typical disturbances. The pattern of the polar cap blackout is confined within the 60° geomagnetic latitude, and is characterised by large diurnal variation. On the other hand, the region of auroral zone blackout elongates towards lower latitudes in the morning hemisphere forming a spiral pattern. Some correlation between the observed patterns and solar proton emission is presented. (a-3, b-1, c-8, d-6, e-0, f-Analysis)

4431. HAYWOOD, A. L., "An Analog Computer for Linear Array Antenna Analysis," USAF, Wright Air Development Division, Air Research and Development Command, WADD Technical Report No. 60-666, Project 6292, Task 40534; November 1960. ABSTRACT: Many antenna design problems could be solved by the Potential Analog Computer. One of the problems that the computer can solve is the determination of array feeding coefficients when only the desired radiation pattern is known. This report discusses the characteristics and

limitations of the computer. A typical symmetrical and an asymmetrical pattern antenna are computed illustrating the use of the Potential Analog Computer. (a-1, b-3, c-1, d-1, e-422, f-Analysis and description)

4432. KEEPING, K. J., "A Wide Band Antenna, Having Axially Symmetrical Patterns, High Gain and Low Side Lobes for all Polarizations," MIT, Lincoln Laboratory, Lexington. See also Department of Commerce PB135696; November 1960. ABSTRACT: This report describes an antenna with its rear feed which has circular symmetry about the axis of its circular waveguide. It has equal E and H plane beamwidths of 0.5° and the side lobe levels attained on the test antenna were more than 20 db below that of the main lobe. The performance of the antenna is compared with theoretical results based on Huygen's Principle. Due to the complicated nature of the primary pattern, it is difficult to define it accurately. Therefore, a close approximation to the actual patterns was used and close agreement is obtained in the positions and relative magnitudes of the first side lobes. The main lobe, as predicted, is in close agreement with the measured pattern. (a-1, b-3, c-1, d-1, e-0, f-Description)

4433. LOSASSO, L., "AZ-EL Technique as a Means of Instantaneous Emitter Location," Airborne Instruments Labs., Inc., Deer Park, Long Island, New York, Report No. 5844-S-1, Contract No. AF 33(616)-5869, ASTIA No. AD-321 742; November 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4434. MADDEN, R., "The Indeterminacies of Measurements Using Pulses of Coherent Electromagnetic Energy," Proc. IEE, Monogr. 417E, p. 5; November 1960. ABSTRACT: The measurements, on a single pulse function of electromagnetic radiation, of the position of a scatterer with polar coordinates R, ϕ are interdeterminate in themselves. The positional indeterminacies are related by $\Delta R \Delta \phi \cong 1/2\lambda_t$, where λ_t is the wavelength of the source. The relation between the indeterminacies of range R and radial velocity V_r is found to be $\Delta R \Delta V_r \cong 1/4\lambda_t c$. It is shown that vector position and vector velocity are not measurable simultaneously, and it is suggested that the 3-dimensional measurement problem is basically limited to non-simultaneous measurements which have restrictions in the presence of multiple scatterers. Similarity is noted to the quantum-mechanical problem. (a-3, b-1, c-1, d-5, e-0, f-Theory)

4435. MC LEISH, C. W., BURTNYK, N., AND COX, L. G., "Development of a Twin-Channel HF Radio Direction Finder," National Research Council of Canada, Radio and Electrical Engineering Division, Report No. ERB-566, ASTIA No. AD-322 247; November 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-179, f-0)

4436. SUESS, R., "A Contribution to the Measurement of Phase Angles and Phase Angle Deviations," Z. InstrumKde., vol. 68, no. 8, pp. 179-188, no. 9, pp. 214-222, no. 11, pp. 274-279; August-November 1960. ABSTRACT: The phase angle between f_1 and $f_2 = nf_1$ ($n = 1, 2, 3, \ldots$) frequencies is measured by using f_1 for the horizontal, and, after 90° phase-shift, for vertical deflection of the beam of a crt, resulting in elliptical deflection of the beam. The f_2 frequency is superposed on f_1 on the vertical deflection plates. The wavelength of f_2 as it appears on the screen is the measure of the phase angle and the motion of the pattern relative to a fixed mark indicates small frequency deviations. Block diagrams are given for equipment intended for ranges from 50 c/s to several Mc/s, and 66 kc/s to 800 Mc/s, respectively. Results, errors and accuracy are discussed. At 66 kc/s the error in phase measurement is less than 0.07° between 0° and 360° and phase deviations down to 0.03° can be measured. Pt II describes an automatic equipment for recording small phase deviations, consisting of a rotating disk with radial slots which is placed in front of the crt screen. A photomultiplier, bistable multivibrator, and recorder are the further elements of the system. Pt III gives some details of a frequency-divider system. The fundamental sine-wave is half-wave rectified and sampled by an electronic switch which in turn is governed by the fundamental. An experimental 200 kc/s - 50 c/s divider is described. (a-3, b-2, c-4, d-4, e-0, f-Descriptive analysis)

4437. SHERRILL, W. M., AND TRAVERS, D. N., "A Direction Finder Analog for the Analysis of Coherent Fields," Southwest Research Institute, San Antonio, Texas, Interim Development Report for Contract NObsr-85086; 1 November 1960. ABSTRACT: During the past two quarters, the design and construction of the Direction Finder Analog has been essentially completed. This Analog is described in detail and its intended purpose explained. It is shown that the Analog can be used to simulate spinning loops or crossed loops in a multi-component field. Either single channel or Watson-Watt twin channel modes may be simulated. Component resolution experiments may also be conducted by simulation of two displaced identical antennas. The other active work on the project is briefly mentioned including tests of ferrite spaced loops. (a-1, b-3, c-1, d-1, e-1000, f-Interim development report)

4438. CAIRNS, F. V., "Microwave Direction Finder," National Research Council of Canada Report Nos. ERB-419 and NRC/REE 30558/54, ASTIA No. AD-319 900; 7 November 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

4439. BRACEWELL, R. N., "Interferometry and the Special Sensitivity Island Diagram," Stanford University, Electronics, Laboratory, Astronomy Institute Publication No. 4, Contract No. AF 18(603)53, AFOSR TN 60-1415, ASTIA No. AD-249 513; 21 November 1960. ABSTRACT: Basic principles of radio interferometry are expounded and a certain special diagram is established which helps with problems on interferometers, especially those with phase switching or other complications. The information on a record, or interferogram, made by scanning a compact source or target with an interferometer comprising an antenna with two well spaced parts, is all in one complex number, the complex visibility of the interference fringes. Under appropriate conditions the complex visibility observed is equal to the complex coherence, of the field produced by the source, between the points occupied by the two elements of the interferometer. (If the elements are not infinitesimal in extent, the complex visibility is equal instead to a weighted mean of the values of complex coherence between the pairs of points embraced by the elements.) Furthermore, this quantity gives the strength of one spatial Fourier component of the source distribution, in amplitude and phase. To know all Fourier components would require the use of all spacings - in two dimensions this means all vector spacings. Measurements at a finite number of spacings yield the principal solution; if the source is finite in extent only certain discrete spacings need be used. Spectral sensitivity of antennas depends on the complex autocorrelation function of the antenna aperture distribution. For interferometers, the spectral sensitivity is confined to islands in the spatial frequency plane whose shorelines may be delineated by a simple graphical procedure. The spectral sensitivity island diagram offers an alternative approach to interferometer problems. In an application of the diagram it is explained how the resolving power of a Mills cross is not impaired by deleting half of one arm. (a-1, b-3, c-1, d-1, e-965, f-Principles of interferometry)

4440. TRAVERS, D. N., AND MOORE, J. D., "A List of Engineering Tolerances for a Rotating High Frequency Three Loop Antenna," Southwest Research Institute, San Antonio, Texas, Task Summary Report Number VII, Contract NObsr-85086; 25 November 1960. ABSTRACT: This report lists numerical engineering tolerances which should be imposed on the important design parameters of a rotating three loop direction finding system which is intended to operate over all of the HF range and the lower portion of the VHF range. As an example, the tolerances cited in this report could be used to specify the design of a rotating three loop antenna for shipboard use between 3.0 mcs and 100 mcs. (a-1, b-3, c-1, d-1, e-1000, f-Specifications for loop antennas. See Abstract No. 4423)

4441. ANONYMOUS, "Evaluation of Aircraft Radio Corporation CD-3 Course Director," Army Aviation Board, Fort Rucker, Alabama, Project No. AVN-260; 30 November 1960. ABSTRACT: An evaluation was conducted of the Aircraft Radio Corporation CD-3 Course Director as installed in a helicopter to determine its suitability for use as a component of the low-frequency tactical navigation system. It was concluded that the CD-3 Course Director as tested is not suitable for use in Army helicopters, and it is recommended that no further consideration be given the Course Director as tested for use in Army helicopters. Since other manufacturers have similar devices under development, effort should be continued to explore the possibility of using this type of presentation in Army helicopters. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

4442. ADAMS, R. T., "Simplified Baseband Diversity Combiner," IRE Trans., vol. CS-8, no. 4, pp. 247-249; December 1960. ABSTRACT: In conventional fm receivers, the gain of the limiters rises during a fade to maintain constant output. The resulting sharp rise in noise complicates the problem of diversity combining, requiring the combiner to provide a very high degree of suppression of noisy signals. By suitable limiter design, the necessary am suppression can be obtained without affecting average receiver gain, permitting the use of simple linear addition at baseband for diversity combining. Cross coupling between limiters of a set of receivers maintains constant combined output. Receivers are simply connected in parallel to

provide any degree of diversity. No additional circuits or components are used for the combining function, since operation does not depend on measurement of out-of-band noise. For the same reason, the system is not disabled by loss of pilot tones or by multi-path distortion products of interference appearing as excess out-of-space noise. The performance of this combiner compares favourably with other current combining methods. (a-3, b-1, c-1, d-1, e-0, f-Design analysis)

4443. BAILEY, A. D., AND DYSON, J. D., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory Quarterly Progress Report, Contract No. DA 36-039-sc-84525, ASTIA No. AD-253 116; December 1960. ABSTRACT: Studies and investigations continued on the design of a RDF system for the MF-HF-VHF range. Construction of the timing generator and pulse modulator for the propagation experiments was completed and the unit is undergoing stability tests. An experimental wide-base phase comparison type RDF was made to work in the field. The experimental results confirmed the theoretical work. Development work continued on panoramic RDF system, a RDF system using phase-lock techniques, and a travelling wave type RDF system. Experimental study of the phase characteristics of the conical equiangular spiral antenna was continued. (a-1, b-3, c-1, d-1, e-282, f-See Abstract No. 4426)

4444. BOECKER, A., MCDONALD, J. F., ET AL., "AN/DLD-1(V)-(XH-1). Volumes I to III," Airborne Instruments Laboratory, Inc., Mineola, New York, Final Development Report, Contract No. AF 33(604)14319, Project 6231, ASD TR 61-214, ASTIA Nos. AD-326 542, AD-326 544, and AD-326 545; December 1960. ABSTRACT: Volume III contains the illustrations associated with Volume II. (a-1, b-3, c-1, d-1, e-0, f-0)

4445. CARRARA, N., CHECCACCI, P. F., ET AL., "Determination of the Direction Corresponding to the Maximum Rate of Radar Echoes from Meteor Trails," Florence University, Florence, Italy, Technical Note No. 1, Contract No. AF 61(052)477, AFCRL-538, ASTIA No. AD-263 876; December 1960. ABSTRACT: The height over the ground was determined corresponding, in a given direction, to the maximum density of echoes from meteor trails which can be detected by Radar. The direction was found corresponding to the maximum rate of radio echoes. The angle of such a direction with respect to the zenith of the Radar is found to be the equivalent of 57 degrees, while preceding results gave 45 degrees. The assumption is made that the radiant distribution is uniform. (a-1, b-3, c-8, d-9, e-0, f-Observation report)

4446. CARTWRIGHT, D. G., "Direction-Finding on Diffuse Sources of Electromagnetic Radiation," Austral. J. Phys., vol. 13, no. 4, pp. 712-717; December 1960. ABSTRACT: It is shown that, for sources of large angular size, the response of an Adcock type direction-finder is independent of the extent of the source in altitude. On the other hand, the response of a rotating loop does depend on altitude. By combining the characteristics of both types of direction-finder, the position and size of an extended source can be found, provided that a brightness profile can be assumed. (a-1, b-1, c-1, d-11, e-0, f-Adcock D/F)

4447. GODDARD, B. R., WATKINSON, A., AND MILLS, B. Y., "An Interferometer for the Measurement of Radio Source Sizes," Australian J. Phys., vol. 13, no. 4, pp. 665-675; December 1960. ABSTRACT: Modifications have been made to the 85.5 Mc/s cross-type radio telescope at Sydney to permit the measurement of radio source sizes in the range of 10" to 1' arc. The basic modification involves the addition of another aerial at a distant site connected by radio link. A new form of automatic gain control ensures very good stability for the system. The modified instrument is described in general terms and calibration techniques and discussed. (a-1, b-1, c-1, d-11, e-0, f-Description)

4448. GODDARD, E. G., "Sferics Monitoring System," IRE Trans., vol. 1-9, no. 3, pp. 315-326; December 1960. ABSTRACT: This monitoring system was developed for use at three arctic sites to study sferic population; the diurnal, seasonal, and auroral effects on vlf propagation; and the locations of sferic sources. The system is an integrated assembly of electronic, photographic, and electromechanical equipment capable of being operated in several different modes to gather the following data: (1) number of sferics occurring in four 20-dB-intensity levels in four 6-hr time blocks; (2) bearing of individual sferics; (3) waveform of individual sferics; (4) time-integrated bearing patterns; (5) noise level and signals in the 12- to 30-kc/s range. A secondary frequency standard at each site is checked against WWV or WWVH daily, and provides a common time reference for the records from all sites. A modified Watson-Watt D/F system with a crossed-loop aerial provides instantaneous bearing. Instantaneous sense is achieved by combining the crossed-loop signals with the signal from an omnidirectional aerial. In addition to the sense function, the latter aerial also provides signal energy to a scanning receiver, a multi-threshold-time-block events counter, and a signal waveform channel. (a-3, b-1, c-1, d-1, e-0, f-Description)

4449. GAMEL, W. W., "Telcar Radio Direction Finding System," Canoga Electronics Corporation, Fort Walton-Beach, Florida, Final Engineering Report, Contract AF 08(606)3980, ASTIA No. AD-253 381; 15 December 1960. ABSTRACT: The TELCAR (Telemetry Carrier Acquisition and Recovery) system is a passive VHF direction finder designed to detect and record the bearing to a radio transmitter. The signal may be unmodulated or modulated by one of the several familiar modes. Bearing information is presented on a circular oscilloscope display permanently recorded on a strip chart. Although designed for use aboard a missile tracking ship, TELCAR is suitable for fixed-station or mobile applications. (a-1, b-3, c-1, d-1, e-0, f-Description)

4450. JONES, W. B., AND GALLET, R. M., "Ionospheric Mapping by Numerical Methods," J. des Telecommunications, vol. 27, no. 12, pp. 260e-264e; December 1960. ABSTRACT: Not available. (a-4, b-1, c-3, d-3, e-0, f-0)

4451. KANAYA, S., AND YOKOI, H., "The Bearing of WWV Signals, Washington, D.C., Observed at Tokyo," Rep. Ionosphere Space Res. Japan, vol. 14, no. 4, pp. 435-440; December 1960. ABSTRACT: The bearing of WWV signals on 10 Mc/s and 15 Mc/s, transmitted from Washington, D.C., was measured in Japan. It was found that the period during which the signal arrived at the true bearing is rather short and that the bearings of the received signals vary over 360° throughout the day. The above phenomenon can be explained reasonably by the propagation mechanism including scattering over all the lands of the globe. A method is suggested for determining the bearing of intensive signals. The bearing thus calculated agrees well with measurement. (a-2, b-3, c-6, d-6, e-0, f-Measurement)

4452. LENSCH, K. P., "Direction-Finder Antennas for High Directional Accuracy and Large Frequency Ranges," Z. angew. Phys., vol. 12, no. 12, pp. 557-567; December 1960. ABSTRACT: Various antennas which are constructed on basis of the cone antenna have been developed and investigated. A highly accurate antenna has been developed with a standing wave ratio of less than 2; deviation lies between plus and minus 1.5°. (a-3, b-1, c-4, d-4, e-0, f-Description and analysis)

4453. RYE, R. T., "Field Pattern Measurements of Various HF Directional Aerials Using Aircraft," Proc. IRE, Australia, vol. 21, no. 12, pp. 879-885; December 1960. ABSTRACT: Tests which established actual field patterns of various full scale horizontally arrayed dipole, rhombic, inclined vee, and Franklin antennas at selected frequencies are described; tests assisted investigation of antenna interaction effects, as well as confirming anticipated theoretical patterns for rhombic and vee antennas, and horizontally arrayed dipoles. (a-3, b-1, c-1, d-11, e-0, f-Measurements)

4454. WHITEHEAD, J. D., "Focusing of Radio Waves Reflected from a Rough Curved Ionosphere," Austral. J. Phys., vol. 13, no. 4, pp. 621-624; December 1960. ABSTRACT: The reflection of radio waves from a partially rough, curved ionosphere is considered. The relationship between the amplitude of the echo, A, and phase path P when the ionosphere moves overhead with a horizontal velocity V at a height h is the same as that for a smooth curved ionosphere, i.e.

$$A^2 \propto 1 - \frac{h}{2V^2}\frac{d^2P}{dt^2},$$

although because of the different physical conditions the large increases in echo amplitude observed when reflection takes place from a smooth ionosphere are not expected for reflection from a rough ionosphere. A method of testing the relationship experimentally is suggested. (a-1, b-1, c-1, d-11, e-0, f-Propagation theory)

4455. WAIT, J. R., "The Electromagnetic Fields of a Horizontal Dipole in the Presence of a Conducting Half-Space," Air Force Cam-

bridge Research Laboratories, Bedford, Massachusetts, Report No. AFCRL-1167; 8 December 1960. ABSTRACT: The problem considered is a horizontal electric dipole which is located above or below the plane surface of a conducting half-space. Expressions for the fields are obtained using three different approaches. The formulas developed are quite simple and, taken together, the whole range of distances from the far-zone to the near-zone is adequately covered. (a-1, b-3, c-1, d-1, e-568, f-Theoretical study)

4456. ANONYMOUS, "Development of an Intercept and Direction Finder," Admiralty, Great Britain, ASTIA No. AD-322 168L; 19 December 1960. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

4457. EGAN, R. D., PRATT, D. S., ET AL., "Fixed Frequency Backscatter," IGY Project 6.12, National Sciences Foundation Grant Y-6, 12/62 Radio Propagation Laboratory, Stanford University, Stanford, California, Data Summary 1 (30 June 1958), Data Summary 2 (10 September 1958), Data Summary 3 (15 April 1959), Data Summary 4 (29 December 1960). ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4458. LEVIS, C. A., "The Selection of a Particular Target Location System for Further Investigation at Very Long Wavelengths," Ohio State University, Research Foundation, Antenna Laboratory, Report No. 1075-5, Contract No. AF 30(602)2214, ASTIA No. AD-323 760; 30 December 1960. ABSTRACT: Report on Radio Location techniques. (a-4, b-3, c-1, d-1, e-0, f-0)

4459. ANONYMOUS, "Engineering Test Model, Antenna AS-1019 (XE-1)/TRD," Granger Associates, Palo Alto, California, Final Report on Design and Fabrication 50 - 320 Mc. D/F Antenna, Contract DA 36-039-sc-84533, ASTIA No. AD-254 830; 31 December 1960. ABSTRACT: Two model antenna systems were developed which met or exceeded the intent of the governing specifications. Although the VSWR exceeds the specifications in isolated instances, the system sensitivity is within specifications since the gain is somewhat greater than required. Recommendations are listed which will improve the VSWR and thereby improve the over-all performance of the system. Considerable effort was expended to make these units simple to erect, maintain, operate and disassemble. Improvements which became apparent as the program progressed are itemized as suggestions for further production models. (a-1, b-3, c-1, d-1, e-0, f-Summary report)

4460. DESTEFANO, J., "Direction Finder Group AN/TLA-9 (Formerly OA-(XE-1)/VRD," Litton Systems, Incorporated, College Park, Maryland, Quarterly Progress Report No. 2, Contract DA 36-039-sc-84961, ASTIA No. AD-252 854; 31 December 1960. ABSTRACT: Research is concerned with design, development, and fabrication of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearings of electromagnetic signals in the frequency range of 1.0 kmc to 10.75 kmc. Antenna and radome assembly designs are progressing satisfactorily. Design of the video processing and display circuits was completed. Westinghouse memory tube WX451 will be used to provide the required displays. The final design of the pedestal and servo systems is approximately 95% complete. Fabrication of the final unit was initiated. The newly assigned nomenclature for this unit is Direction Finder Group AN/TLA-9). (a-1, b-3, c-1, d-1, e-0, f-Research report. See Abstract No. 4402)

4461. ARCHBALD, R., HOFFMAN, D., ET AL., "Special Purpose Analysis Techniques," New York University, College of Engineering, Quarterly Report No. 2, Contract DA 36-039-sc-84968, ASTIA No. AD-254 268; 31 December 1960. ABSTRACT: Continued progress is reported on the development of an automatic direction finding system. A description is given of a miniaturized high voltage power supply developed for the cathode ray tube display of the system. In addition, the circuitry necessary for internal waveform generation in the system is described. A study of computer controlled operations for analyzing continuous wave signals has been made. Tuning a receiver, determining signal modulation and obtaining signal spectrum are operations which are described. A discussion of computer features which would lead to faster and more effective analysis of signals is outlined. These features are specified in order to serve as guide in the selection or design of a computer for use in signal analysis. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 4401)

1961

4462. FEDERICI, M., "The Accuracy of Measuring the Direction of a Sound Source by a Directional Receiver System," National Research Council of Canada, Technical Translation 956, 1961. See also La Ricerca Scientifica, vol. 29, no. 11, pp. 2301-2313; 1959. ABSTRACT: The author examines the directional accuracy of the various systems by which the directions of radiating sound or radio wave generators are determined. He considers four different methods of detecting minimums, including a correlation system as well as one for determining the coincidences of zeros. According to his findings, the direction finding accuracy does not depend on the circuit applied but solely on the signal-to-noise ratio and on the directional characteristics of the receiver system. (a-1, b-3, c-9 and 1, d-9, e-813, f-Study; original citation: See Abstract No. 3974)

4463. PRITCHARD, J.S., LOVELL, J.A., AND DROGIN, E.M., "Semi-Automatic Flight Inspection of Navigation-Aid Stations," IRE Internat. Convention Record, vol. 9, pt. 5, pp. 16-27; 1961. ABSTRACT: The inspection of US ground based VOR and TACAN is carried out by ground and airborne checks. A new semi-automatic system for airborne inspection is described. Each inspecting aircraft carries 11 VOR, 11 TACAN and 4 DME sets. Flights are made over a pre-arranged route, positional fixing is ensured by measurement of range from chosen stations. This is used in order to compute bearings from the stations under test. These bearings are compared with continuous recordings of those measured in flight. A computer prepares flight plans for the automatic pilot, and processes the flight data. (a-2, b-1, c-1, d-1, e-0, f-Description)

4464. SAYBEL, A.G., "Radio Direction Finding," Fundamentals of Radar. Moscow: Sovetskoye Radio, 1961. See NASA N64-24634; ASTIA AD-298779, pp. 171-225 (NASA N64-24634 17-09; NASA N64 24638.) ABSTRACT: Chapter pertaining to radio direction finding. The chapter covers phase methods, amplitude-phase methods, and amplitude methods of direction finding. The accuracy of amplitude methods is evaluated, and formation of the equal-signal direction is discussed. Generating the equal-signal direction in the vertical plane, determining target height, and automatic direction tracking systems are described. (a-4, b-6, c-2, d-2, e-0, f-Reference textbook)

4465. ANONYMOUS, "Electronic Warfare," Central Signals Establishment, Report No. CSE/S.49/1/E.W., ASTIA No. AD-328 036; January 1961. ABSTRACT: Not available. (a-3, b-3, c-1, d-5, e-0, f-0)

4466. ALBRECHT, H.J., "Applying the Chordal-Hop Theory of Ionospheric Long-Range Propagation of Echo-Signal Delay," Proc.IRE, vol. 49, no. 1, pp. 356-357; January 1961. ABSTRACT: Regarding measurements of the time taken by a short-wave signal to complete a path around the earth, the literature contains accounts by various research workers. As a comprehensive study on the subject, Hess used 218 measurements to obtain an average value of 0.13778 second for one complete path. This value has been found to be, for the accuracy indicated, independent of frequency, relative magnetic field characteristics, and seasonal and diurnal variations of ionospheric characteristics. Assuming the velocity of light to equal 299,792 km/sec, the above value yields 41,308 km as the distance really travelled by the signal. Its ratio to the distance on the earth's surface amounts to 1.03271, defined as the "Path Factor." As given by Hess, the above-mentioned series of measurements results in delay values between 0.1376 and 0.1381 second, being equivalent to path factors between 1.0312 and 1.0354. According to Lassen, measurements can be taken as representative between 0.1370 and 0.1384 second or path factors 1.027 and 1.037. Furthermore, Humby, Minnis, and Hitchcock discuss measurements of delays between signals arriving at London via short and long routes resulting in 61-63 msec and 76-78 msec for circuits London-Singapore and London-Colombo, respectively. These values yield path factors between 1.005 and 1.038 for the Singapore circuit, and between 1.013 and 1.039 for the other one. Attempts to interpret these time-delay readings in terms of the orthodox propagation theory of multiple hops between ionospheric layers and the earth's surface led to theoretical path factors of 1.032 and 1.043 for reflection heights of 200 and 300 km, respectively, at a take-off angle of six degrees. Continuing his research work on long-distance propagation, the author analyzed such echo-signal delays with the aid of his chordal-hop theory and found an apparently much closer agreement between measurements mentioned and theoretical results according to this theory. In fact, with given ionospheric charcteristics, path factors are between 1.0289 and 1.0347 for a take-off angle of six degrees. However, at a take-off angle of four degrees, and under the same ionospheric conditions, values agree almost precisely with those measured by

Hess, viz., path factors are between 1.0302 and 1.0359. In a more general sense, it was found that chordal-hop propagation permits path factors between 1.021 and 1.039. Postulated and proved in 1956 and 1957, the chordal-hop theory requires that a normal, largely predominant mode of long-range propagation follows a path reflected by ionospheric layers without touching the earth's surface. As its name implies, the ray is supposed to be propagated along the ionosphere by chordal hops with minimum path heights varying from a few kilometers to a hundred and more, because of changes in ionospheric characteristics. The author's work in this field has yielded very satisfactory results, particularly as far as new approaches to path-attenuation calculations and comprehensive propagation analysis are concerned. The successful use of the chordal-hop theory for echo-delay calculations, as described in this note, appears to present another general proof of this propagation concept. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4467. BRACEWELL, R.N., "Interferometry and the Spectral Sensitivity Island Diagram," Trans. IRE, vol. AP-9, no. 1, 11, pp. 59-57; January 1961. ABSTRACT: Basic principles of radio interferometry are expounded and a special diagram is established which helps with problems on interferometers, especially those with phase switching or other complications. The information on a record, or interferogram, made by scanning a compact source or target with an interferometer comprising an antenna with two well-spaced parts, is all in one complex number, the complex visibility of the interference fringes. Under appropriate conditions, the complex visibility observed is equal to the complex coherence of the field produced by the source between the points occupied by the two elements of the interferometer. (If the elements are not infinitesimal in extent, the complex visibility is equal, instead, to a weighted mean of the values of complex coherence between the pairs of points embraced by the elements.) Furthermore, this quantity gives the strength of one spatial Fourier component of the source distribution in amplitude and phase. To know all Fourier components would require the use of all spacings - two dimensions, this means all vector spacings. Measurements at a finite number of spacings yield the principal solution; if the source if finite in extent, only certain discrete spacings need be used. Spectral sensitivity of antennas depends on the complex autocorrelation function of the antenna aperture distribution. For interferometers, the spectral sensitivity is confined to islands in the spatial frequency plane whose shorelines may be delineated by a simple graphical procedure. The spectral sensitivity island diagram offers an alternative approach to interferometer problems. In an application of the diagram, it is explained how the resolving power of a Mills cross is not impaired by deleting half of one arm. (a-1, b-1, c-1, d-1, e-0, f-Interferometry principles)

4468. BRACEWELL, R.N., AND SWARUP, G., "The Stanford Microwave Spectroheliograph Antenna, A Microsteradian Pencil Beam Interferometer," Trans. IRE, vol. AP-9, no. 1, pp. 22-30; January 1961. ABSTRACT: A pencil beam interferometer has been constructed at Stanford, Calif., with multiple beams of 3.1 minutes of arc width to half power (0.8 microsteradian). It is composed of two equatorially-mounted, 16-element, Christiansen arrays of 3-m paraboloids, each 375 feet long (1255 wavelengths at a wavelength of 9.1 cm). The half power beamwidth of the fan beam of a single array is 2.3 minutes of arc. To form the pencil beam, the two arrays are switched together as in a Mills cross. Frequency range is from 2700 to 3350 Mc. Phase adjustment and monitoring are handled by a new technique of modulated, weakly reflecting gas-discharges maintained at the focus of the paraboloids. Television-type scanning yields maps of the sun (spectroheliograms) revealing fine details of the microwave source regions in the chromosphere and corona. All the transient bursts and a large fraction of the steady solar emission at 9.1 cm prove to originate in a small number of highly compact centers, whose brightness temperatures may exceed 5×10^5°K. The sensitivity of the instrument also allows the thermal emission from the moon (250°K) and a number of galactic and extragalactic sources to be studied with high angular resolution. Illumination of the moon by terrestrial radar can be detected. The pencil beam interferometer furnishes the finest beams currently available from pencil beam antennas of any type. Examination of the fundamentals of extracting high resolution details of a source from its radiation field indicates the fitness of pencil beam interferometers, incorporating steerable multielement arrays, for future development to higher resolving power. Adequate technique of phase preservation over wide spacings is available. (a-1, b-1, c-1, d-1, e-0, f-Description)

4469. BRACEWELL, R. N., "Tolerance Theory of Large Antennas," Trans. IRE, vol. AP-9, no. 1, pp. 49-58; January 1961. ABSTRACT: The design of an antenna calls for definite amplitudes and phases of the currents, but when the antenna has been constructed and adjusted, there will be departures from the design currents because of several factors. The customary procedure of taking radiation patterns and making the final adjustments semi-empirically has usually been satisfactory, but two difficulties have been setting in with the trend towards large antennas of high gain. First, it is impossible to measure the radiation pattern of the largest existing antennas; even the determination of single sections through the pattern or the gain in one direction presents difficulty. Second, the adjustments themselves are more laborious on larger antennas. It is therefore very desirable that the theory of antenna tolerances should be pursued so that the effect of departures can be taken into account, statistically or otherwise, during the design. This paper considers the effects of systematic and random errors on the radiation pattern of antennas representable by a field distribution over an aperture, such as paraboloidal reflectors and large arrays of small elements. In the case of paraboloids, the deterioration in directivity is found to depend on the mean square departure of the surface from the paraboloid of best weighted least-squares fit and on the two-dimensional autocorrelation function of the departure. The variation of directivity with wavelength of a particular paraboloid is deduced by leaving out of account those two-dimensional Fourier components of the departure with spatial periods less than a wavelength. Practical steps are considered for unifying testing, adjusting, and design so as to lead to the greatest relaxation of the mechanical tolerances imposed on construction. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4470. CHRISTIANSEN, W. N., LABRUM, N. R., MCALISTER, K. R., AND MATHEWSON, D. S., "The Crossed-Grating Interferometer: A New High-Resolution Radio Telescope," Proc. IEE, Paper No. 3364 E, vol. 108 A, pp. 48-58; January 1961. ABSTRACT: For the first time, a radio telescope has been constructed with sufficient directivity for the production of detailed "radio pictures" of the brightness distribution onthe solar disc at decimetre wavelengths. The aerial systems, which operates at 21 cm wavelength, consists of two long mutually-perpendicular arrays, each made up of 32 paraboloid antennae, 19 ft in diameter, spaced uniformly along a 1200 ft base-line. The polar diagram of each array is a set of fan-shaped beams, with high resolution in one direction only. A pencil-beam response (with multiple beams) is produced by combining the signals from the two arrays by a phase-switching method. With the dimensions used, these pencil beams are 3' of arc in diameter and about 1° apart. West-east scanning is provided by the earth's rotation, and the north-south position of the beams can be adjusted by a phase-shifting mechanism. A series of parallel profiles across the sun is obtained; these profiles may be combined to give a "picture" of the solar disc. For satisfactory performance, side lobes in the arrays must be kept at a very low level. To achieve this, the current distribution is tapered from the centre to the ends of each array, and very close tolerances are maintained on the phase relationships between the elements. Phase errors due to thermal expansion of the long twin-wire feeder system are avoided by arranging the lines so that all the elements are connected to the receiver through equal lengths of feeder. The design and construction of the instrument are described in detail. An account of the techniques used in testing and adjusting the arrays is given. (a-3, b-1, c-1, d-5, e-0, f-Description)

4471. DOBROTT, D., AND ISHIMARU, A., "East-West Effect on VLF Mode Transmission across the Earth's Magnetic Field," J. Res. Nat. Bur. Stand., vol. 65D, no. 1, pp. 47-52; January-February 1961. ABSTRACT: The effect of a constant transverse magnetic field is analysed for the propagation of vlf electromagnetic waves about the earth. These waves are considered to be propagating by modes in a parallel-plate waveguide. The lower boundary of the guide is considered to be a perfect conductor, while the upper boundary is assumed to be a sharply defined, semi-infinite, homogeneous plasma with a constant magnetic field applied. The source of these waves is an infinite number of short, horizontal, cophased dipoles, uniformly spaced parallel to the constant magnetic field vector. Admittance relations are derived for the upper boundary of the guide by considering the waves to be of grazing incidence. It is found that these admittance parameters depend on the direction of propagation. These admittance parameters are plotted versus frequency for various heights. Expressions for eigenvalues and the eigenfunctions are found as functions of the admittance. By employing a two-dimensional Green's function, the amplitudes of the various modes due to the dipole source are evaluated. It is noted that the propagation constants differ depending on the direction of propagation, thus offering an explanation of the east-west effect of vlf transmission. A numerical example is calculated and field strength versus distance values are found to correspond to some experimental results. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4472. DRESNER, A., "Spiral In-Line Array," Airborne Instrument Laboratories, Deer Park, Long Island, New York, Report No. 5841-S-5, Contract No. AF 33(616)5869, ASTIA No. AD-321 743; January 1961. ABSTRACT: Not available (a-4, b-3, c-1, d-1, e-0, f-0)

4473. HU, Y. Y., "A Method of Determining Phase Centers and Its Application to Electromagnetic Horns," Journal Franklin Institute, vol. 271, no. 1, pp. 31-39, January 1961. ABSTRACT: A method of locating the phase centre of any radiating system from the expression of its radiating field is formulated. This method is then applied to electromagnetic horns of different dimensions and flare angles. The results and discussions presented are useful in the design and positioning of the feeding horn such that the paraboloidal reflector will produce a desirable radiation pattern. (a-3, b-1, c-1, d-1, e-0, f-Principles)

4474. KRAUS, J. D., NASH, R. T., AND KO, H. C., "Some Characteristics of the Ohio State University 360-Foot Radio Telescope," IRE Trans., vol. AP-9, no. 1, pp. 4-8; January 1961. ABSTRACT: Design considerations and performance characteristics of The Ohio State University 360-foot radio telescope are discussed. The telescope is well suited for precision position and intensity measurements at frequencies from 30 to 2000 Mc. The beamwidths expected at 2000 Mc are about 11 by 30 minutes of arc. Factors involved in determining the antenna temperature are considered, and an estimate is made of the expected temperature. A completely steerable parabolic dish is the most versatile radio telescope. Unfortunately, the cost of this type increases exponentially with aperture. If one is willing to confine his observations to regions close to the meridian, the antenna design can be greatly simplified and a telescope of larger aperture constructed for the same cost. For sky mapping, such a restriction is no hardicap since observations can be made most precisely along the meridian. Furthermore, in mapping the entire sky, the region under observation at the moment is of little importance. These were some of the factors which led to the development of the 360-foot Ohio State University standing-parabola tiltable-flat-reflector radio telescope now nearing completion near Delaware, Ohio. The telescope is a meridian transit instrument designed to provide a large aperture per unit cost. It is especially well suited for precision position and intensity measurements of localized radio sources and of the sky background radiation over a very wide frequency range. (a-1, b-1, c-1, d-1, e-0, f-Description)

4475. LANGE, F. H., "Development Trends of Modern Position-Finding Technique: Correlation Position-Finding Methods," Nachrichtentechnik, vol. 11, no. 1, pp. 2-7; January 1961. ABSTRACT: New applications of correlation electronics in electro-acoustics and in position-finding technique are described. The various methods of position finding are briefly outlined. The principles of crosscorrelation with a single information channel and with two information channels are then explained, the first of these having application to electroacoustics and the second to radioastronomy. Equipment for phase measurement, using a synchrodyne detector, is described, with block diagram, and also crosscorrelation equipment, and their use for various purposes is discussed. A table shows the connection between the time parameters and the spectral parameters of a signal, and this connection is shown in a diagram for the case of a pulse signal of rectangular form. Another diagram gives the autocorrelation function for a wide-band noise spectrum. Since correlation electronics in recent years has begun to play an important part in industrial automatization technique, its extension in other directions will probably follow. (a-3, b-2, c-4, d-4, e-0, f-Description)

4476. MAGNUSKI, H., "Jamming of Communication Systems Using F.M., A.M., and S.S.B. Modulation," IRE Trans., vol. MIL-5, pp. 8-11, January 1961. ABSTRACT: Different modulation systems are considered and the necessary power density for jamming of each system is discussed. It is concluded that effective jamming of fm and other systems with threshold systems is easier than that of am and, particularly, the ssb systems. However, for nuisance jamming, the opposite is true. Finally, the jamming of ssb systems is considered in more detail and it is proved that the so-called reduced-carrier ssb systems are not easier to jam than systems with a completely suppressed carrier. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

4477. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Quarterly Progress Report No. 2, Contract No. DA 36-039-sc-84966, ASTIA No. AD-256 959; January 1961. ABSTRACT: Four task areas have been established on a program whose objective is to lay a foundation for the development of an automated tactical radio-direction-tuning of a network of radio receivers by means of a standard 60-word-per-minute teletype circuits, (2) investigation of semi-automatic bearin read-out, evaluation, and transmission, (3) investigation of field-data evaluation and processing techniques, and (4) over-all systems study and planning. The major effort was devoted to the design and construction of equipments to automatically encode receiver tuning instructions for teletype transmission, and to automatically decode and servo-tune the slave receivers of the direction-finding network. The investigation of semi-automatic bearing read-out, and the evaluation of field data have been started, and a tentative solution to these problems has been accomplished. (a-1, b-3, c-1, d-1, e-505, f-See Abstract No. 4429)

4478. ANONYMOUS, "Airborne Ferret Data Processing Techniques," Litton Industries, Beverly Hills, California, Electronic Equipments Division, Final Engineering Report, Contract No. AF 33(616)5560, ASTIA No. AD-323 035; 1 January 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4479. MAYES, P. E., AND CARREL, R. L., "Logarithmically Periodic Resonant-V Arrays," IRE-Western Electronics Show and Convention; 1 January 1961. ABSTRACT: Method of achieving higher directivity from log-periodic arrays of resonant elements; use of log-periodic dipole array at higher frequencies by employing higher order resonances of dipoles; directivities of 17 db over isotropic radiator estimated from radiation patterns measured in higher order modes. (a-3, b-8, c-1, d-1, e-0, f-Descriptive analysis)

4480. TRAVERS, D. N., MOORE, J. D., SHERRILL, W. M., AND LOVELY, H. E., "Methods for the Reduction of Reradiation Error in Naval High Frequency Shipboard Direction Finding," Southwest Research Institute, San Antonio, Texas, Final Report for Project No. 448, Contract No. NObsr 64585; 1 January 1961. ABSTRACT: Developments are reviewed in high frequency shipboard direction finding which are concerned with reradiation error reduction and improved methods for error calibration, and which have occurred at Southwest Research Institute during the period from 1955 to 1960. A brief introduction of shipboard direction finding is given as related to reradiation error, with possible solutions to the problem. It is concluded that the greatest probability of an overall solution is to be found when strong reradiation is accepted as a normal condition, and the direction finder antenna is designed to separate the reradiation from the primary field, either exactly or approximately. This approach is in opposition to past approaches of avoiding reradiation, or trying to prevent reradiation. The effects of reradiation on existing simple loop direction finders are reviewed. These effects appear as characteristics of a calibration curve of error versus observed bearing. New automatic methods used to obtain calibration curves are reviewed. A review of various antennas considered for reradiation error performance is given with a summary of the more practical antennas. The development of the three loop array is reviewed. Shipboard test data showing a marked improvement over the simple loop is repeated from an earlier reporting. It is concluded that use of the simple loop above 4.0 mc should be discontinued for most naval surface ships, and replaced by the three loop antenna. The effects of improper installation procedures are described and recommendations made for the new antenna system. If certain installation procedures are ignored, the performance of the direction finder may be so poor as to render it useless. These installation procedures are not particularly demanding on the configuration of the ship but frequently involve only care with respect to the electrical design of the supporting structure of the antenna. Component resolution direction finding is reviewed; experimental work now in progress is reported in some detail and projected work for the future is described. It is recommended that this method be pursued with particular care and attention to the methods of extracting and using information from separated antennas. A direction finder analog system is described which can be used to predict the performance of conventional direction finders used with reradiation or in a variety of ways which have not yet been attempted experimentally. The Southwest Research Institute antenna site is described. Conclusions and recommendations are presented and a complete bibliography of all references consulted during the course of this project is presented at the end of the report. The Appendix describes a method for testing spaced loops in a screen room. (a-1, b-3, c-1, d-1, e-1000, f-Theory and experiment)

4481. GOLTON, E., "Skip-Distance Ray-Focusing in the Ionosphere," Nature, vol. 189, pp. 48-49; 7 January 1961. ABSTRACT: Observations of 20 Mc/s signals from satellite Sputnik 3 received at Slough on occasions when the satellite was close to or beyond the horizon and at heights below 300 km, provide evidence for strong ionospheric focusing of waves travelling along paths close to the skip-distance path. The effect has been observed when the signal is received by direct reflection from the ionosphere, and when a ground reflection preceder the ionospheric one. (a-3, b-2, c-1, d-5, e-0, f-Propagation experiment)

4482. ARCHBALD, R., ET AL., "Special Purpose Analysis Techniques," New York University, College of Engineering, Quarterly Report No. 1, Project No. 3-99-06-001-01, ASTIA No. AD-249 586; 24 January 1961. ABSTRACT: Feasibility studies are being conducted to determine optimum techniques for analyzing, displaying, and/or

identifying signals received by countermeasure receivers. The investigation is directed toward the design of equipment to assist the operator in the analysis and/or identification of special signals. The development of an automatic direction finding system initiated under Contract No. DA-36-039-sc-74990 is continued. An analysis is presented of the errors which may be attributed to an antenna used in the system. A description is given of an antenna currently being tested. A study started under Contract No. DA 36-039-sc-74883 for utilizing a small general purpose digital computer in signal analysis is continued. Also presented is a development of a photographic recording technique for digital signal data, a discussion of computer input data rate required and of computer operation in conjunction with a crystal video receiver, a description of methods for filtering the signal environment, a review of the detection of pulse signals in noise, and a consideration of the effect of noise on the computer analysis program. (a-1, b-3, c-1, d-1, e-0, f-Study report. See Abstract No. 4461)

4483. SPITALNY, A., "Submarine Instrumentation Study Program," United Aircraft Corporation, Norwalk, Connecticut, Norden Division, Report No. 249 R 0006, Contract NOnr 305600, ASTIA No. AD-323 108; 26 January 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4484. BAILEY, A. D., DYSON, J. D., AND OTHERS, "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," Electrical Engineering Research Lab., University of Illinois, Urbana, Quarterly Progress Report No. 6, Contract No. DA 36-039-sc-84525, ASTIA No. AD-253 116; 30 January 1961. ABSTRACT: Studies and investigations continued on the design of a RDF system for the MF-HF-VHF range. Construction of the timing generator and pulse modulator for the propagation experiments was completed and the unit is undergoing stability tests. An experimental wide base phase comparison type RDF was made to work in the field. The experimental results confirmed the theoretical work. Development work continued on panoramic RDF system, a RDF system using phase-lock techniques, and a travelling wave type RDF system. Experimental study of the phase characteristics of the conical equiangular spiral antenna was continued. (a-1, b-3, c-1, d-1, e-282, f-See Abstract No. 4426)

4485. ANONYMOUS, "Evaluation of Shoran/Tacan ECM System," Army Electronic Proving Ground, Fort Huachuca, Arizona, Report No. AEPG-SIG 920-173, ASTIA No. AD-322 445; February 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4486. ANONYMOUS, "Radiogoniometric Investigation of Thunderstorms and Clouds of Great Electrical Activity," Genoa University, Genoa, Italy, Final Technical Report No. 1, Contract No. DA 91-591-euc-1270, ASTIA No. AD-254 440; 28 February 1961. ABSTRACT: Results obtained in the radiogoniometric investigation of thunderstorms and clouds of great electrical activity are presented. Observations recorded with the Ceraunometer (Electric-field-change counter) installed in stations at Genova, Monte Capellino, Livorno, and Sauze d'Ouix are treated. Preliminary results are presented with an Atmoradiograph obtained at Genova in the frequency of atmospherics at a radius of 500 to 1000 km. Details are given of the cathode rays direction finder (CRDF), and methods adopted for its control, especially those used in the interpretation of fotograms. Chief results derived from the first months of observation made in Genova and Livorno with the CRDF are treated. (a-3, b-3, c-8, d-9, e-0, f-Experimental results)

4487. COTTONY, H. V., AND WILSON, A. C., "A High-Resolution Rapid-Scan Antenna," J. Res. Nat. Bur. Stand., vol. 65D, no. 1, pp. 101-110; January-February 1961. ABSTRACT: An electronically scanned aerial array is described. It consists of a broadside array of 7 Yagi elements spaced 1.4 wavelengths apart. Each element aerial is connected to a preamplifier-convertor. Each convertor is connected to a local oscillator differing by 20 c/s from that connected to the convertor for the adjacent element. All oscillators are locked in phase. The convertor outputs are connected to a common IF amplifier. This arrangement produces a 5.8° beam swept over a 41.8° azimuth sector at a rate of 20 scan/sec. The system operates at 40.92 Mc/s. The output of the system is displayed on an oscilloscope, and data on the direction of arrival and character of a distant vhf signal are presented visually. Sample records of signal components propagated by ionospheric scatter, meteor trail reflections, and sporadic-E layer are cited. (a-1, b-1, c-1, d-1, e-0, f-Description)

4488. JOHLER, J. R., "Magneto-Ionic Propagation Phenomena in Low- and Very-Low-Radiofrequency Waves Reflected by the Ionosphere," J. Res. Nat. Bur. Stand., vol 65D, no. 1, pp. 53-65; January-February 1961. ABSTRACT: LF-VLF ionosphere reflection coefficients which illustrate the dependence of the amplitude and phase of the reflected wave upon the direction of propagation relative to the direction of the earth's magnetic field are presented. The calculations are based on a plane, sharply bounded, model ionosphere with plane wave excitation, but employ full use of the magneto-ionic formulas for complex directions of propagation in the ionosphere such that the influence of the earth's magnetic field in the different directions of propagation is demonstrated. A special table of values applicable to VLF is presented. (a-1, b-1, c-1, d-1, e-0, f-Analysis and discussion)

4489. KSIENSKI, A., "Equivalence between Continuous and Discrete Radiating Arrays," Canad. J. Phys., vol. 39, no. 2, pp. 335-349; February 1961. ABSTRACT: The radiation patterns produced by continuous excitation distributions and discrete arrays are compared and the conditions are derived under which one type of source may be substituted for the other with negligible errors. It is shown that the aperture lengths in both cases should be the same, but the element spacing is dependent on the type of pattern desired. Examples are computed to demonstrate these relations for both directive patterns and shaped beams. (a-3, b-1, c-1, d-7, e-0, f-Comparative analysis)

4490. LINDSAY, W. J., AND HEIM, D. S., "Considerations in the Automation of the Spinning-Goniometer Radio Direction Finder," University of Michigan, Office of Research Administration, Technical Memo. No. 85, Contract No. DA 36-039-sc-78283, ASTIA No. AD-277 395; February 1961. ABSTRACT: Some aspects of instrumentation design are discussed in making a spinning-goniometer radio direction finder essentially automatic in operation. Also discussed is the application of narrowband synchronous post-detection filtering for improving the bearing sensitivity. (a-1, b-3, c-1, d-1, e-0, f-Discussion)

4491. MIYA, K., SASAKI, T., AND ISHIKAWA, M., "Observation of F-Layer and Sporadic-E Scatter at V.H.F. in the Far East," J. Res. Nat. Bur. Stand., vol. 65D, no. 1, pp. 92-99; January-February 1961. ABSTRACT: Describes properties of sporadic-E scatter and F-layer scatter observed over the Okinawa-to-Tokyo path (1480 km) and the Philippines-to-Tokyo path (2850 km), operating at frequencies of about 50 Mc/s. Sporadic-E scatter is often observed on the Okinawa signal in the evening hours and has the closest correlation (0.94 in correlation ratio) with the occurrence of sporadic-E characterised by the descriptive symbol M of all ionospheric factors. The bearing of the sporadic-E scatter shows a regular diurnal variation similar to that of the normal E-layer scatter. F-layer scatter generally appears on the Philippine signal in autumn when the F-layer at the path midpoint displays an anomaly denoted by the symbol R or S, having a top frequency of higher than 14 Mc/s. A pulse test exhibited a pattern of multipath signals extending over more than 1 msec. The bearing of the F-layer scatter, an evening phenomenon, gradually deviates westwards from the great-circle path with the lapse of time. (a-3, b-1, c-1, d-1, e-0, f-Observation report)

4492. TODD, W., "A Variable Time-Constant Servo System," Army Signal Research and Development Lab., Fort Monmouth, New Jersey, ASRDL Technical Report No. 2173, ASTIA No. AD-252 457; February 1961. ABSTRACT: An automatic method for varying the time-constant of a servo system is described. The time-constant is adjusted so that when input errors are low, the time-constant is increased (to obtain the greatest integration time); and when input errors are large, the time-constant is reduced to provide minimum velocity lag, thus permitting the servo to follow rapidly changing functions. Application of the principles to a meteorological direction finder (Rawin Set AN/GMD-1) is described. (a-1, b-3, c-1, d-1, e-0, f-Description)

4493. WAIT, J. R., "A New Approach to the Mode Theory of VLF Propagation," J. Res. Nat. Bur. Stand., vol. 65D, no. 1, p. 37; January-February 1961. ABSTRACT: An attempt is made in this paper to present a concise derivation of the mode theory of VLF propagation. Taking note of the fact that the important modes for long-distance propagation are near grazing, suitable approximate forms of the wave functions are introduced at the outset, rather than at the end, of the analysis. It is thus possible to account for the influence of earth curvature in a relatively concise manner. The influence of the earth's magnetic field is also discussed. Finally, numerical results for the attenuation and the phase velocity of the dominant mode are presented. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4494. WHEELER, H. A., "Useful Radiation from an Underground Antenna," J. Res. Nat. Bur. Stand., vol. 65D, no. 1, p. 89, January-February 1961. ABSTRACT: An underground antenna delivers power to the surrounding conductive medium, and a fraction of the power goes out as radiation above the surface. This fraction is denoted the "radiation efficiency." It is expressed in simple terms for two types of underground antennas. The first and simplest is a vertical loop in a submerged spherical radome. The second is a submerged horizontal insulated wire with each end connected to a ground electrode. In each case, the efficiency is the product of three simple factors: The first depending on the index of refraction between air and ground, the second proportional to the size (radius of the radome or length of the wire); the third giving the attenuation with depth. An example for 1 megacycle per second gives an efficiency of 0.0014 for an underground wire of specified dimensions. The radiation efficiency is applicable to sender or receiver. (a-1, b-1, c-1, d-1, e-0, f-Descriptive theory)

4495. MOORE, J. D., AND TRAVERS, D. N., "The Application of Ferrite Cores to the Coaxial Spaced-Loop Antenna," Southwest Research Institute, San Antonio, Texas, Interim Development Report, Direction Finder, Radio, Shipboard Siting and Design, Study and Development, Contract No. NObsr-85086; 1 February 1961. ABSTRACT: The application of ferrite cores to the coaxial spaced loop antenna has been under investigation for the past five months. Several ferrite cored models of a spaced loop have been constructed and field tested. Usable spaced loop antenna patterns have been obtained at 5.0 mc with very low volume ferrite cored spaced loop antennas. Construction tolerances necessary for the ferrite cored spaced loop are not as severe as those necessary in air core spaced loop antennas having much greater volumes. The known design criteria for ferrite cored spaced loop antennas are summarized and specific antenna designs are described. These antennas were designed to obtain a specified untuned effective height in the frequency range of 3.2 to 100 mc. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4496. ROCK, P., "Radio Direction Finder Set AN/BRD-4," Servo Corporation of America, Hicksville, New York, Interim Development Report No. 1, Contract NObsr 81281, ASTIA No. AD-355 338L; 2 February 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4420)

4497. LEVIS, C. A., AND BAECHLE, J. R., "Radio Location Techniques," Ohio State University Research Foundation, Antenna Laboratories, Final Report, vol. 1, Contract AF 30(602)2214, Report No. 1075-8, ASTIA No. AD-323 199; 4 February 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4498. HULTQVIST, B., AND LISZKA, L., "Some Characteristics of a Swept Frequency Interferometer for 35-65 Mc/s," Kiruna Geophysical Observatory, Sweden, Report No. 1, Contract No. AF 61(514)-1314, Task 1; 15 February 1961. ABSTRACT: Not available. (a-4, b-3, c-8, d-17, e-0, f-Progress report)

4499. EGELAND, A., "Very-Low Frequency Radio Wave Propagation over a Long High-Latitude Path," Kiruna Geophysical Observatory, Sweden, Report No. SR9, Contract No. AF 61(052)418, ASTIA No. AD-447 876. Reprint: Arkiv for Geofysik, vol. 3, no. 22, pp. 539-556; 22 February 1961. ABSTRACT: This report deals with ionospheric propagation of radio waves at 16 kc/s between Rugby, England, and Kiruna, Sweden, a distance of about 2100 km. The results of the investigations on VLF are summarized under the headings of field strength and its 24-hour, its day-to-day, and its seasonal variation, as well as the effects of ionospheric, magnetic and solar disturbances. (a-1, b-1, c-8, d-17, e-0, f-Propagation study)

4500. ROSENTHAL, M. L., AND KELLY, J. J., "Antenna Set, AN/TLA-4," General Electronic Laboratories, Cambridge, Massachusetts, Progress Report No. 7, Contract DA 36-039-sc-78015; 24 February 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4501. GODZINSKI, Z., "The Surface Impedance Concept and the Structure of Radio Waves over Real Earth," Proc. IEE, Monogram 434E; March 1961. ABSTRACT: Discusses the concept of surface impedance as applied to the theory of radio-wave propagation over a real, i.e., inhomogeneous and irregular, earth; some of the conclusions may also be of value in the theory of waveguides, cavity resonators and certain types of aerial. The advantages and limitations of the surface-impedance concept are shown in connection with a very general integral equation for the field strength. The approximations and physical phenomena underlying the surface-impedance concept are first discussed in the simplest case of a homogeneous and flat earth. The analysis is then extended to a horizontally stratified earth, it is then possible to characterize the earth by certain effective parameters depending on frequency and the geometric structure of the soil. The same is also true in the cases of a spherical or not too excessively irregular earth. The discussion is then generalized to the case of an arbitrarily inhomogeneous earth. The height/gain function and the shape of the ellipse of polarization are discussed. Approximate boundary conditions for the Hertzian vector and Hertzian scalar function are related to the concept of surface impedance. Practical conclusions are drawn with regard to the existence and measurement of the effective earth constants and to some aspects of geological prospecting by radio methods. (a-3, b-1, c-1, d-5, e-0, f-Discussion)

4502. HARRINGTON, R. F., "Sidelobe Reduction by Nonuniform Element Spacing," IRE Trans., vol. AP-9, no. 2, pp. 187-191; March 1961. ABSTRACT: A perturbational procedure for reducing the sidelobe level of discrete linear arrays with uniform amplitude excitation by using nonuniform element spacing is presented. The calculation of the required element spacings is quite simple. The method can reduce the sidelobe level to about 2/N times the field intensity of the main lobe, where N is the total number of elements, without increasing the beamwidth of the main lobe. Several examples are given. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4503. HARRISON, C. W., AND KING, R. W. P., "Folded Dipoles and Loops," Trans. IRE, vol. AP-9, no. 2; March 1961. ABSTRACT: In Section I the theory of linear arrays consisting of two or more closely spaced elements that are interconnected by lumped reactances is reviewed. Specific application is made to two-element end-loaded folded dipoles and monopoles constructed of conductors with different diameters, to series tuned three-wire folded dipoles and monopoles, and to a three-wire-line reactor and impedance transformer. In Section II the circular folded dipole or Halo antenna is treated. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4504. HEFLEY, G., LINDFIELD, R. F., AND DAVIS, T. L., "The Ephi System for VLF Direction Finding," J. Res. Nat. Bur. Stand., vol. 65C, no. 1; January-March 1961. ABSTRACT: A new system of VLF direction finding has been developed and tested by the National Bureau of Standards, Boulder, Colorado. The system has been named "Ephi" (E-ϕ) because the bearing of the transient signal is determined from the relative phase (ϕ) of the vertical electrical field (E) received at spaced antennas. The advantage of this scheme compared to conventional crossed-loop techniques is that it minimizes siting and polarization errors. A minimum of three antennas must be used to resolve directional ambiguity, and the preferred antenna location is at the vertices of an equilateral triangle with baselines equal to 1/3 to 1/10 wavelength (at 10 kc). Appropriate phase detectors, delay lines and coincidence circuits are used to obtain a directional code in preset sectors. Within practical instrumentation limits any number of sectors of variable widths can be operated simultaneously and each can be rotated in azimuth. (a-1, b-1, c-1, d-1, e-716, f-Experimental results)

4505. HARTZ, T. R., AND HUTCHISON, R. L., "On the Measurement of the Angle of Arrival of Solar Radiations at Metre Wavelengths. I: A Method for Locating Apparent Radiation Sources in the Solar Corona," Defense Research Telecommunications Establishment, Canada, Report No. 1057, ASTIA Nos. AD-256 749, AD-266 466; March 1961. ABSTRACT: Solar radio emissions at meter wavelengths are thought to originate in a relatively small region at some height above the sun's photosphere. The direction of arrival of such radiations may be measured at the earth by means of a two-element interferometer. This report outlines a method of determining the apparent location of a radio source in the corona, and discusses the inherent limitations of this technique. (a-1, b-3, c-1, d-7, e-0, f-Discussion)

4506. KING, R. W. P., AND HARRISON, C. W., JR., "Cylindrical Shields," Trans. IRE, vol. AP-9, no. 2; March 1961. ABSTRACT: The effectiveness of an imperfectly-conducting cylindrical shield of small cross section depends on both the attenuation through the metal wall of the externally maintained field and the amplitude of the current that is induced in the cylinder. When the length of the cylinder, which behaves like a linear scattering antenna, approaches a resonant value, the currents induced in the walls and the field inside the tube are relatively large. Under these conditions, large currents may be induced in a thin dipole placed coaxially within the shield. (a-1, b-1, c-1, d-1, d-0, f-Shielding analysis)

4507. PRESSEY, B. G., ASHWELL, G. E., AND HARGREAVES, J., "Phase Variation of Very-Low-Frequency Waves Propagated over Long Distances," Proc. IEE, vol. 108, Part B, no. 38, pp. 214-226; March 1961. ABSTRACT: Study of phase variation of 10-20 kc waves over distances up to 600 km, in interest of their use in navigational aids of phase-comparison type; relative phase variations over pair of adjacent paths. (a-3, b-1, c-1, d-5, e-0, f-Analysis and evaluation)

4508. SHANKS, H. E., "A New Technique for Electronic Scanning," Trans. IRE, vol. AP-9, no. 2, pp. 162-166; March 1961. ABSTRACT: The concept of time-modulated aerials has recently been demonstrated as a means of overcoming many of the limitations currently restricting advances in the art. Of special importance is the mathematical possibility of generating a pattern complex capable of providing simultaneous scan operation. This characteristic is realized by periodic time-modulation of the aperture distribution. The theory of simultaneous "scanning" using time-modulation techniques is discussed and it is shown that the required pattern complex is generated by a progressive-pulse aperture excitation. The fundamental equations and relationships concerning the form of pulse excitation and "scanning" coverage are derived. In addition, practical methods of physically generating the proper pulse-excited aperture are described, and the necessary detection requirements are delineated. (a-3, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4509. STUTZ, S. L., "Full-Scale Aerial Deployment of Radio Beacon AN/ART-32(XA-1)," Operational Support Engineering Division, Wright Air Development Division, Wright-Patterson Air Force Base, Ohio, WADD TR 60-903, ASTIA No. AD-255 257; March 1961. ABSTRACT: Radio beacon AN/ART-32(XA-1) was developed to alert and guide search and rescue parties, both on the ground (sea) and in the air, to the crash location. The radio beacon, by radio signal, indicates that the crash has occurred and, by a continuing radio signal, serves as a directional guide that will lead searchers to rendezvous at the crash site. The beacon is automatically catapulted and deployed from the air or from the ground. Inertial switches located within the aircraft carrying the beacon react to catapult the beacon from the aircraft upon impact with the earth or other objects. Results are presented of a series of parachute drop tests and one ground launching to produce automatic deployment for use in case of airplane crash. Various aspects of the complete equipment required for the deployment cycle performed satisfactorily, however, some of the equipment failed due to certain natural limitations, design deficiencies, and packaging and shipping methods. (a-1, b-3, c-1, d-1, e-0, f-Survey)

4510. BEUKERS, J., "Investigation into Selectivity and Co-Channel Operation of a Doppler Type Direction Finder AN/TRD-15," Servo Corporation of America, Long Island, New York, Final Report, Contract No. DA 36-039-sc-84941, ASTIA No. AD-255 966; 1 March 1961. ABSTRACT: Investigation and study was made on the possibility of achieving a greater degree of selectivity and of being able to obtain bearing information from the weaker of 2 co-channel signals in the HF Doppler Direction Finder, AN/TRD-15. A brief description of the fundamental principles of the equipment is given. A theoretical and experimental analysis of the spectra containing the wanted bearing information, and produced by the commutating process, is made. The coherent detector and feed-forward techniques for obtaining greater selectivity and co-channel operation respectively are described, and the experimental findings reported. Various methods of phase compression are considered. A panoramic type of display and IF display and tuning indicator are described. Some of the circuitry used in the investigation is described including the coherent detector, amplifiers and limiters used in the feed-forward technique. Schematics of the breadboard monitor and detector are presented. (a-1, b-3, c-1, d-1, e-966, f-Study report)

4511. LLOYD, A. T., "Direction Finder Helps Recover Discoverer Capsule," Electronics, vol. 34, no. 9, pp. 42-45; 3 March 1961. ABSTRACT: The Retriever airborne direction-finding system described in the paper gives long-range continuous homing in azimuth on low-intensity am, fm, and cw signals in the vhf band (no frequencies quoted). It works by lobe-switching between two 35° radiation patterns intersecting at 2.5 dB below maximum gain (12 dB), with side-by-side visual comparison of signals on a crt indicator. The aerial consists of two vertical four-element matched Yagis connected through a phase-delay cable. Its best location on the aircraft was determined by scale-model tests. The receiver is stated to have very high sensitivity (no figures given), and the indicator uses pulse-stretchers. The system was developed for recovery of re-entry capsules. A prototype ship-board installation acquired at over 59 miles, while a prototype C-130 installation gave air-to-surface acquisition over 200 miles and air-to-air at 400 miles. The service C-119 installation at 15,000 ft receives strong signals from a ground target at 190 miles (i.e., beyond quasi-optical range). Homing accuracy of ±1° is quoted. (a-2, b-2, c-1, d-1, e-0, f-Description)

4512. ANONYMOUS, "Description and Evaluation of Category I Tests of AN/TLQ-8(XW-1)," Thompson Ramo Wooldridge, Inc., Canoga Park, California, Final Report No. C10-OS89, Contract AF 30(602)-1687, 7 March 1961, ASTIA No. AD-322 597. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4513. BRINKS, W. J., "Hidden Transmitter Location by Pulse Arrival Measurements," Diamond Ordnance Fuse Laboratories, Washington, D.C., Report No. TR-907, ASTIA No. AD-271 584; 22 March 1961. ABSTRACT: A method is presented for determining the location of an uncooperative radar transmitter by timing the pulses of the transmitter after they have been reflected or transduced by a moving target of known location. A procedure is discussed for assessing the errors involved. (a-1, b-3, c-1, d-1, e-0, f-Discussion)

4514. REYNOLDS, D. K., AND BARTLEMAY, J. M., "Long-Wire Antenna for Meteor Burst Communications," Electronics, vol. 34, no. 12, pp. 40-42; 24 March 1961. ABSTRACT: Simple, low cost antenna system suitable for radio communications in 30-100 Mc region, with signals propagating along paths established by reflections from ionised meteor trails in outer atmosphere; straight wire several wavelengths long is used because its split-lobe pattern makes it ideally suited for meteor burst communications. (a-3, b-2, c-1, d-1, e-0, f-Description)

4515. ARCHBALD, R., HOFFMAN, D., AND OTHERS, "Special Purpose Analysis Techniques," New York University, College of Engineering, New York, Quarterly Report No. 3, Contract DA 36-039-sc-84968, ASTIA No. AD-259 736; 31 March 1961. ABSTRACT: Progress is described in the development of a miniaturised automatic direction finding system. A method of calibration is given for units of the system that were packaged in final form. The linearity requirements on a receiver are detailed. Two different antenna arrays are described which can be used with the direction finder. An experimental program for determining the feasibility of using a general purpose digital computer for signal analysis problems was started. The Packard-Bell Company 250 computer and countermeasures receiving set AN/TLR-1 are the major units explained. A method for using a digital computer to control the operation and interpret the output of a direction finding unit for pulse signals is described. Techniques for implementing the system are outlined. Computer programs to perform the desired system control and data interpretation are developed. (a-1, b-3, c-1, d-1, e-967, f-Progress report. See Abstract No. 4482)

4516. DESTEFANO, J., "Direction Finder Group AN/TLA-9 (Formerly OA-(XE-1)/VRD)," Litton Systems, Inc., College Park, Maryland, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-84961, ASTIA No. AD-256 548; 31 March 1961. ABSTRACT: Final packaging design of the AN/TLA-9 system was completed and fabrication of the component parts is approximately 60 percent complete. Design of the servo system was also completed and successfully temperature-cycled. Preliminary electrical tests were conducted on the final configuration of the antenna and radome assemblies with satisfactory results. Electrical assembly of the final unit was started. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4460)

4517. PACKARD, R. F., AND COHN, M., "Steerable Antenna Techniques for Airborne Ferret Reconnaissance," Electronic Communications, Inc., Timonium, Maryland, Final Report, Contract No. AF 19 (604)5234, ASTIA No. AD-255 821; 31 March 1961. ABSTRACT: A direction finder system is described in which the phase of a signal from a spiral phase antenna is measured with respect to the phase of the same signal from a constant phase reference antenna in order to determine bearing. Phase is measured with an electronically controlled ferrite phase shifter. System components which were developed are described. Radiation pattern measurements at 700 mc of the antennas separately and as a system are reported. This direction finder determines bearings unambiguously. Simultaneous omnidirectional and directive azimuth antenna patterns are possible. Study of a coaxial TE11 mode ferrite rotator for possible incorporation in a cavity-backed annular slot spiral phase antenna is reported. As an alternative of ferrite devices, ferroelectric phase shifters are suggested. Large predicted phase shifts were achieved. Ferroelectric phase shifters offer potential advantages over ferrite phase shifters in size, weight, speed, and power requirements. (a-1, b-3, c-1, d-1, e-0, f-Description)

4518. ANONYMOUS, "Radio Rabbits," Illinois Wildlife, vol. 16, no. 4, p. 12, April 1961. ABSTRACT: Not available. (a-4, b-1, c-1, d-1, e-0, f-Biotelemetry)

4519. DAVIES, D. E. N., "A Fast Electronically Scanned Radar Receiving System," J. Brit. IRE, vol. 21, no. 4, pp. 305-321; April 1961. ABSTRACT: Describes some of the properties of an electronically scanned receiving system at very high scanning rates. The basic principles of the system are applicable to either an electromagnetic or an acoustic receiving aerial system, but the particular system described relates to a microwave aerial in the 3 cm band, and is capable of scanning rates up to 1 Mc/s. The possible application of these principles to "within-pulse" scanning echo-ranging systems is also discussed. (a-3, b-1, c-1, d-5, e-0, f-Description)

4520. HEFLEY, G., DOHERTY, R. H., AND LINFIELD, R. F., "Initial Results of a New Technique for Investigating Sferic Activity," J. Res. Nat. Bur. Stand., vol. 65D, no. 2, pp. 157-166; March-April 1961. ABSTRACT: A technique for the measurement of sferics on a massive scale has been developed. The technique pertains largely to spectral and directional measurements. Representative samples of data are presented and discussed. The data samples include: (1) diurnal variations in sferic rates as a function of the 10.5, 40, and 100 kc/s component amplitudes; (2) sferic rates as a function of triggering level; (3) directional measurement of sferic rates; (4) correlation of directional sferic rates with weather reports; (5) sferic amplitude distributions at 10.5, 40, and 100 kc/s, and (6) comparison of the distribution of amplitudes of the sferics from two different storm areas. Recommendations for future measurements are made. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4521. HORNER, F., "Narrow-Band Atmospherics from Two Local Thunderstorms," J. atmos. terrest. Phys., vol. 21, no. 1, pp. 13-25; April 1961. ABSTRACT: Atmospherics from two local storms at known distances were recorded on magnetic tape. The frequencies of reception were 11 Mc/s for one storm and both 6 kc/s and 11 Mc/s for the other. The power bandwidths were in the range 200-300 c/s. The duration, peak amplitude, mean field strength and mean power flux have been deduced from the records, and estimates of the radiated power were derived. The waveforms of the atmospherics are partly explicable in terms of known characteristics of lightning discharges, but there are many features, particularly at 11 Mc/s, for which an adequate quantitative explanation is lacking. The results conflict with some theories of the origin of high-frequency atmospheric noise which have been advanced in recent years. (a-3, b-1, c-1, d-5, e-0, f-Experiments)

4522. HU, MING-KUEI, "Fresnel Region Fields of Circular Aperture Antennas," J. Res. Nat. Bur. Stand., vol. 65D, no. 2, pp. 137-147; March-April 1961. ABSTRACT: A different approach to the Fresnel region field approximation is introduced. Instead of using the conventional truncated power series expansion approximation, the Newton's iteration formula for square root is used. By using such an approximation for circular apertures with tapered illumination of the form $(1 - \zeta^2)^n$, the Fresnel region fields can finally be expressed in terms of a new class of functions $W_0^n(\gamma, u)$. The function W_0^0 is shown to be related to the Lommel's functions of two variables, and the function W_0^n is then obtained from the function W_0^{n-1} by a simple recurrence relationship. Field distributions for n = 0, 1, 2, 3, 4 and at distances 1/4 D^2/λ, 1/3 D^2/λ, 1/2 D^2/λ, D^2/λ, $2D^2/\lambda$, ∞ have been computed and presented as sets of curves. General and quantitative properties of the fields are clearly demonstrated by these curves. It is also shown that the field of any other nonuniform illumination with circular symmetry can be expressed in terms of the fields of the basic illumination of the form $(1 - \zeta^2)^n$. (a-3, b-1, c-1, d-1, e-0, f-Theory)

4523. PAGE, H., PHILLIPS, G. J., AND FOX, J. A. S., "An Analogue Computer for Aerial Radiation Patterns," Electronic Engng., vol. 33, pp. 206-212; April 1961. ABSTRACT: An analogue computer was constructed to calculate the horizontal radiation patterns of aerial arrays comprising a number of radiating elements, mounted on a central support mast. The radiation pattern of a single element must be known, and from this the pattern for a number of identical elements round the mast may be calculated. The currents in the elements may have any desired amplitudes and phases. The principle used is the addition of a number of audio-frequency voltages, each component representing the radiation from one element in a particular direction. By using a bank of rotary switches, the appropriate summations are made in turn for bearings at intervals which may be either 7.5° or 15°, the resultant being indicated on a meter. The computer may be adapted to other types of visual display. (a-3, b-2, c-1, d-5, e-0, f-Description)

4524. PAPPAS, C. F., VOGLER, L. E., AND RICE, P. L., "Graphical Determination of Radio Ray Bending in an Exponential Atmosphere," J. Res. Nat. Bur. Stand., vol. 65D, no. 2, p. 175; March-April 1961. ABSTRACT: This paper presents a simple engineering method for calculating the amount of bending undergone by a radio ray passing through an exponential model atmosphere. For any initial takeoff angle and for values of the surface refractivity ranging from 200 to 450, the bending angle τ may be determined as a function of height above the earth's surface, using a few graphs and a few calculations. Indications of the accuracy of the method are given at the end of the paper. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4525. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Quarterly Progress Report No. 3, Contract No. DA 36-039-sc-84966, ASTIA No. AD-260 933; April 1961. ABSTRACT: Effort was devoted to the completion and demonstration of the equipments to automatically encode tuning instructions from a master R-390/URR HF radio receiver into teletype signals, and to automatically decode the teletype signals and servo-tune one or more slave R-390/URR HF radio receivers of a direction-finding network. The investigation of semi-automatic bearing read-out, and the preliminary processing of field data were continued. Tentative solutions to these two problems were formulated. (a-1, b-3, c-1, d-1, e-0, f-Progress report. See Abstract No. 4477)

4526. TARTAKOVSKII, G. P., "Range Finder with Frequency Modulation in Presence of Noise and Fluctuations in Reflected Signal," Radiotekhnika i Elektronika, vol. 6, no. 4, pp. 536-544; April 1961. See also English translation in Radio Engineering and Electronic Physics, vol. 6, no. 4, pp. 473-480. ABSTRACT: Formulas for systematic errors and fluctuation errors in FM range finder; dependence of errors on various parameters; recommendations. (a-3, b-1, c-2 and 1, d-2, e-0, f-Analysis)

4527. THAYER, G. D., "A Formula for Radio Ray Refraction in an Exponential Atmosphere," J. Res. Nat. Bur. Stand., vol. 65, no. 2, p. 181; March-April 1961. ABSTRACT: A formula for the radio ray refraction angle, τ, is derived by integration of the approximate differential equation for the case where the refractivity, $(n - 1) \times 10^6$, decreases exponentially with height above the surface of a smooth, spherical earth. The solution is in terms of the widely tabulated exponential and error functions, and is accurate to within 4 percent over the useful range of the variables employed. (a-1, b-1, c-1, d-1, f-0, f-Theory)

4528. UTLAUT, W. F., "Effect of Antenna Radiation Angles upon HF Radio Signals Propagated over Long Distances," J. Res. Nat. Bur. Stand., vol. 65D, no. 2, p. 167; March-April 1961. ABSTRACT: Observations of a HF continuous wave radio signal which after propagating over east-west paths 6800 and 8400 kilometers in length were received on antennas having different vertical-plane radiation angles indicate that very low radiation-angle antennas may be advantageous for use in long-distance communication systems. Much of the time, hourly median signal levels received on antennas with radiation angles less than 2 degrees exceeded those received at angles of 15 degrees by 10 decibels while signals received at angles between 2 and 5 degrees were 5 decibels greater than those received at 15 degrees. No significant change in the fade rate of the signal received at various radiation angles was found. A limited amount of data obtained during ionospheric storms suggests that the radio signal received on a low radiation-angle antenna is deteriorated by storm effects for a shorter time, and to a lesser degree, than is the signal received by a high radiation-angle antenna. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4529. WHEELER, H. A., "Radio-Wave Propagation in the Earth's Crust," J. Res. Nat. Bur. Stand., vol. 65D, no. 2, p. 189; March-April 1961. ABSTRACT: There is a reasonable basis for postulating the existence of a useful waveguide deep in the earth's crust, of the order of 2 to 20 km below the surface. Its dielectric is basement rock of very low conductivity. Its upper boundary is formed by the conductive layers near the surface. Its lower boundary is formed by a high-temperature conductive layer far below the surface, termed the "thermal ionosphere" by analogy to the well-known "radiation ionosphere" far above the surface. The electrical conductivity of the basement rock has not been explored. An example based on reasonable estimates indicates that transmission at 1.5 kc/s might be possible for a distance of the order of 1500 km. This waveguide is located under land and sea over the entire surface of the earth. It may be useful for radio transmission from the shore to a submarine on the floor of the ocean. The sending antenna might be a long conductor in a drill hole

deep in the basement rock; the receiving antenna might be a vertical loop in the water. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4530. TRAVERS, D. N., LOVELY, H., AND SHERRILL, W., "A Method of Goniometer Scanning the Coaxial Spaced Loop Direction Finder for Vertical Polarization," Southwest Research Institute, Task Summary Report Number VIII, Contract NObsr-85086; 1 April 1961. ABSTRACT: The three-loop antenna for high frequency shipboard direction finding developed by this laboratory under Contract NObsr-64585 has demonstrated the advantages of a multiloop antenna in the presence of reradiation. The design of the three loop antenna encompassed a spinning coaxial spaced loop. Major engineering problems associated with a spinning antenna of this type are the rotary coupling transformer, remote power requirements, and realization of sufficient sensitivity. While these problems were successfully solved in the design of a three-loop antenna, for use with an AN/SRD-7 direction finder receiver, it would be advantageous in the future to be able to avoid them by means of a nonrotating array of loop antennas. It is the purpose of this report to present the results of a series of experiments conducted to demonstrate the feasibility of using a fixed array of loop antennas, operating in the coaxial spaced loop mode, in conjunction with a conventional sine-cosine goniometer taken from DAQ high frequency receiving equipment. At the concept of this investigation, it was decided to perform the experiments within a narrow range of frequencies between 9.0 and 12.0 mc. This limitation was imposed in order to avoid construction tolerance problems at the lower frequencies, and circuit resonances at the higher frequencies. In particular an inherent resonance in the DAQ goniometer near 18 mc is a limiting factor. Another factor was the design of the cross-over network and transmission lines which produced a second resonance defining an upper frequency limit. These frequency limitations were considered of secondary importance as the validity of the theory to be demonstrated by the experiment was entirely independent of frequency. As the investigation progressed, the ease with which results were obtained suggested that the frequency range of the experiment be extended to cover 3.0 to 29.0 mc. The initial frequency limitations were in part circumvented by engineering changes to the original design. (a-1, b-3, c-1, d-1, e-1000, f-Experimental results)

4531. FRERES, C. H., "Observations of Arrival Angles of Meteor Burst Signals at 46.6 Mc/s," U.S. Navy Electronics Laboratory, Research Report 1036, San Diego, California; 4 April 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Experiment)

4532. MONSER, G. J., "Pickup Devices for Very-Low-Frequency Reception," Electronics, vol. 34, no. 15, pp. 68-69; 14 April 1961. ABSTRACT: Research into LF pickups has led to Hall device as receiving element, rather than loop and whip antennas conventionally used; Hall device's sensitivity changes by only 7 db over frequency range 10 to 10,000 cps; loop and whip antennas experience 60-db sensitivity change over same range. (a-3, b-2, c-1, d-1, e-0, f-Description)

4533. LOVELY, H., AND TRAVERS, D. N., "Shipboard Comparison of the AN/URD-4 and the DFG-4 VHF-UHF Direction Finding Equipments," Southwest Research Institute, Task Summary Report Number IX, Contract NObsr-85086; 15 April 1961. ABSTRACT: A shipboard comparison of the VHF-UHF AN/URD-4 rotating Adcock antenna and the Servo Corporation DFG-4 Doppler antenna was conducted in late March 1961 to determine their relative performance for conditions of reradiation caused by scattering objects in the environment of the receiving antenna. A foremast top location was utilized for both antennas, a condition which while assuring relatively low error for both equipments made the objectives of the test difficult to achieve. Low error was obtained for both equipments under the circumstances, however, bearings were obtained with somewhat greater ease with the DFG-4 equipment. This was probably the result of integration which is used in the azimuth indicator circuits, thus making the output display relatively insensitive to the rapid fluctuations of the received signal as noted with the AN/URD-4. It is concluded that provided certain investigations to be conducted at a land site do not reveal new errors or sensitivity objections the DFG-4 equipment is superior to the AN/URD-4 equipment. (a-1, b-3, c-1, d-1, e-1000, f-Evaluation)

4534. RIDDLE, M. M., "Design and Fabrication of Receiver Radio R-902(XE-1)/PRD," P. R. Mallory and Co., Inc., Indianapolis, Indiana, Final Report, Contract No. DA 36-039-sc-78351, ASTIA No AD-264 545; 15 April 1961. ABSTRACT: Design work and test results are described on the experimental model of radio receiver R-902(XE-1)/PRD. This receiver is a portable, low battery drain equipment covering the 100 to 400 mc range. Final performance of the experimental model of R-902 receiver and its major subassemblies is discussed. Problem areas and measures taken to improve the final receiver design are presented. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4102)

4535. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory, Progress Report No. 7, Contract No. DA 36-039-sc-84525, ASTIA No. AD-257 536; 30 April 1961. ABSTRACT: Investigations continued on the design of a radio direction finding (RDF) system for the MF-HF-VHF range. The full instrumentation for an experimental MF/HF phase comparison RDF system was decided upon. Study of an antenna for the UHF phase comparison system was continued. The wave-antenna RDF system was moved into the field for evaluation. Experimental investigations of automatic bearing data readout systems using phase-lock and panoramic techniques were continued. (a-1, b-3, c-1, d-1, e-282, f-Progress report. See Abstract No. 4484)

4536. BAIN, W. C., "Directional Observations on Delayed Signals on an Ionospheric Forward-Scatter Circuit," Proc. IEE, Paper 3509E, vol. 108 B, pp. 253-256; May 1961. ABSTRACT: A study has been made of delayed signals reaching Slough from a transmitter at Gibraltar on 37 Mc/s in the winter of 1956-57. The mean bearing of the first signal to arrive after that due to ionospheric forward-scatter was found to vary between 250° and 290° during the day; the spread of energy in bearing is also considered. It is shown that the radiation from the transmitter aerial must be stronger to the west than to the south. Results for the second delayed signal are also given. Round-the-world echoes were occasionally observed, but these did not arrive from the direction of the great circle containing Gibraltar and Slough. (a-3, b-1, c-1, d-5, e-0, f-Study)

4537. BAIN, W. C., "Studies of Ionospheric Forward Scattering Using Measurements of Energy Distribution in Azimuth," Proc. IEE, Paper 3508E, vol. 108 B, pp. 241-252; May 1961. ABSTRACT: Measurements of phase and amplitude have been carried out on signals on 37 Mc/s received from a transmitter at Gibraltar. The receiving sites were at Slough and Castlemartin, which are each about 1740 km from Gibraltar, and were equipped with pairs of aerials whose spacing could be varied from λ to 10λ. The results were not consistent with the idea that the forward-scattered signal was due to the combination of many randomly-phased radio waves. Frequently one signal appeared to be dominant, as might be expected if reflections from meteor trails formed an important part of the resultant signal. The calculation of an azimuth power distribution on the basis of phase measurements with different aerial spacings then becomes of uncertain validity. Some results obtained in this way are presented, but reliance is placed mainly on work with a small, fixed aerial spacing. This shows a marked diurnal variation of mean bearing; at Slough for most of the year it is on average 7°W of the Gibraltar bearing by night but 0°W by day. A comparison with observations at Castlemartin in Wales suggests that the scattering process is due almost entirely to meteor reflections by night but that during the day there is also present a component due to turbulent scattering which contributes rather more than half the total energy. (a-3, b-1, c-1, d-5, e-0, f-Experimental results)

4538. BARON, A., AND BLANK, S., "Emitter-Location Techniques," Airborne Instrument Laboratory, Inc., Mineola, New York, Progress Report, ASTIA No. AD-324 005; May 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4539. DONNELLAN, J. R., "A Spiral-Doublet Scanning Array," IRE Trans., vol. AP-9, no. 3, pp. 276-279; May 1961. ABSTRACT: An array of eight spiral doublets, each doublet consisting of a pair of equally-excited two-wire spirals inthe same plane and wound in opposite senses, was used to scan a beam of horizontal polarization over a ±40° range simply by rotations of the spiral doublets. The combination of a microstrip ring network and twin lead provided a balanced feed for each spiral in the array. Sidelobe levels were those predicted (25 dB for the broadside pattern and - at the test frequency of 1430 Mc/s - were, in general, below 19 dB over the 80° scan. A novel microstrip feed harness provided isolation, between the doublets and served to absorb most circulating currents. This printed circuit feedboard consisted of judiciously-grouped microstrip ring networks and provided the desired feeding coefficients to within ±0.1 dB. An application of the array for tracking purposes is also described. (a-3, b-1, c-1, d-1, e-0, f-Description)

4540. HICKMAN, C. E., NEFF, H. P., AND TILLMAN, J. D., "Theory of Single-Ring Circular Antenna Array," Trans. Amer. Inst. Elect. Engrs., vol. 80, Part 1, no. 54, pp. 110-115, May 1961. ABSTRACT: Rigorous analysis of circular antenna array, which satisfies actual boundary conditions on all of elements, exact determination of radiation pattern after which some customary approximations are introduced; results of pattern analysis lead to simple synthesis method, which will approximate desired pattern with good accuracy. (a-3, b-1, c-1, d-1, e-0, f-Detailed analysis)

4541. SIMPSON, T. L., AND TILLMAN, J. D., "Parasitic Excitation of Circular Antenna Arrays," IRE Trans., vol. AP-9, no. 3, pp. 263-267; May 1961. ABSTRACT: A method of calculating the radiation pattern of a circular aerial array of parallel monopoles or dipoles using symmetrical components is presented. The results obtained when only one element of the array is excited are not particularly good. However, if an additional element is added at the centre of the array a fairly good directional pattern results. The sidelobe level is dependent upon the tuning of this central element, and a graphical analysis is given which opt mises this tuning. Calculated and measured patterns are shown and compared. Sidelobe levels of 15 dB and a beamwidth of 78° are typical. The principal advantage of this aerial lies in the fact that the pointing of the beam can be changed by simply changing the element that is excited. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4542. ULBRICHT, G., "Accuracy of Direction Finding Systems," Z. fuer Flugwissenschaften, vol. 9, no. 4-5, pp. 140-142; April-May 1961. ABSTRACT: Report on investigation made in Institute of Aeronautical Electronics, of Deutsche Versuchsanstalt fuer Luftfahrt (DVL), Germany, which were aimed at generally applicable representation of radial error for navigation systems. (a-3, b-2, c-4, d-4, e-0, f-Investigation)

4543. WELSBY, V. G., "Two-Element Aerial Array," Electronic Technology, vol. 38, no. 5, pp. 160-163; May 1961. ABSTRACT: Two-element multiplicative antenna system is described which uses signal waveforms composed of number of sinusoidal components; although signal/noise performance is not as good as multi-element additive antenna array having equivalent directional patterns principle may be used to produce simplified form of electron scanning system. (a-3, b-2, c-1, d-5, e-0, f-Description)

4544. SHERRILL, W. M., LOVELY, H. M., AND TRAVERS, D. N., "Direction Finder Analog Investigation of the Application of Single Channel Component Resolution to Shipboard Direction Finding," Southwest Research Institute, Report No. 3, Contract NObsr-85086; 1 May 1961. ABSTRACT: The general component resolution properties of the simple loop antenna in a multicomponent field are established by theoretical argument and experimental results. The results of an initial evaluation of the application of component resolution techniques to shipboard direction finding are reported. The evaluation was carried out by means of the Direction Finder Analog. A symmetrical placement of spinning loop antennas with respect to the reradiating structure is found to be the optimum configuration for component resolution. As a result of this investigation a field test of the component resolution technique has been started. The present development of the non-rotating eight loop antenna for use with the twin channel receiver is reported. Initial discussion of the characteristics of multi-channel direction finders is presented especially with respect to the fast response time obtainable. The results of an initial investigation of the response of a narrow band IF amplifier to a short duration carrier wave transmission are presented. (a-1, b-3, c-1, d-1, e-1000, f-Theory and experimental results)

4545. SKLAR, H., "Study of Optimization of Airborne Direction Finding Systems in the VHF-UHF Frequency Ranges," Granger Associates, Palo Alto, California, Final Report, AFCRL 319, Contract No. AF 19(604)5509, ASTIA No. AD-256 752; 1 May 1961. ABSTRACT: A new method for reducing the bearing errors associated with present day VHF-UHF airborne direction finding systems was studied. The method is essentially that of incorporating an ideal detector into the receiver section of a D/F system. Initially the problem was treated as one in communication theory by considering the pattern distortions as additive random noise. Alternate approaches investigated included use of the information contained in recorded D/F patterns to optimize the detector. A formal solution employing this approach was obtained but to obtain numerical answers would have involved computer programing difficulties beyond the scope of this study. Analysis of available D/F patterns showed that operating on a single harmonic of a D/F pattern instead of the entire pattern resulted in increased bearing accuracy. The instrumentation necessary to determine bearing from a single harmonic is relatively simple. A number of the techniques investigated may provide bearing error reduction. The single harmonic technique shows that greatest promise. (a-1, b-3, c-1, d-1, e-0, f-Description)

4546. BAECHLE, J. R., HARDMAN, W. E., AND MURPHY, E. R., "Radio Location Techniques," Ohio State University Research Foundation, Antenna Laboratory, Progress Report No. 1 on Phase 2, Contract AF 30(602)2214, ASTIA No. AD-324 144; 4 May 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4497)

4547. ROCK, P., "Radio Direction Finder Set AN/BRD-4," Servo Corporation of America, Long Island, New York, Interim Development Report, Contract NObsr-81281, Report No. SCA-16400-R4, ASTIA No. AD-329 811L; 5 May 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4496)

4548. EGAN, R. D., AND PETERSON, A. M., "The Influence of Sudden Ionospheric Disturbances on Backscatter Sounding," 6th AGARD Ionospheric Research Committee Meeting on Disturbances of Solar Origin on Communications; 15-18 May 1961, Naples, Italy. ABSTRACT: Not available. (a-4, b-3, c-8, d-9, d-0, f-Analysis)

4549. TRAVERS, D. N., "Interim Development Report for a Study Technique to Produce a High Frequency Land Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, Interim Report No. 1, Contract No. NObsr-85364; 15 May 1961. ABSTRACT: This initial report briefly summarizes in chronological sequence the important prior technical events which led to this project. Important literature pertinent to the Beverage antenna or the wave tilt phenomena in the high frequency range is referenced. Site survey and construction work on the large sector Beverage array (as proposed in Southwest Research Institute's proposal 6-1442 of 7 November 1960) has been initiated. This array will be constructed in two stages; the initial stage being a 90 degree sector using 300 meter long antennas separated two degrees in azimuth and radiating outward from an inner circle radius of 100 meters. The antenna will be directed toward the northeast quadrant. At a later date it is planned to extend the antennas to a length of 400 meters. A second Beverage array covering a full 360 degree of azimuth is also under construction. It will utilize 36 antennas, 120 meters long spaced 10 degrees apart, and radiating outward from an inner circle radius of 80 feet. It is intended that the smaller array will be used for specific tests with a phase and gain matched twin channel receiver so as to make possible experiments which will lead to a continuous resolution method. It is expected that the first pattern measurements with a field strength meter will be conducted before 1 June 1961 using antennas in the 360 degree array. (a-1, b-3, c-1, d-1, e-1000, f-Development report)

4550. ANONYMOUS, "Service Test of Homing Loop Antenna AT-784( )/PRC," Army Arctic Test Board, Fort Greely, Alaska, Project No. ATB 1-191, ASTIA No. AD-258 636L; 25 May 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

4551. EGAN, R. D., AND PETERSON, A. M., "Backscatter Observations of Sporadic E," Stanford University, Radio Science Laboratory, National Science Foundation Report No. 2, Grant Y 22-10/309; 30 May 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Propagation experiment report)

4552. ANONYMOUS, "Electronic Subsystem for SR-178 Global Surveillance System," Loral Electronics Corporation, New York, Final Report, Phase 2; 31 March 1961, Report No. 246(2701-051), Project NR 7990, ASTIA No. AD-323 442L. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4553. ANONYMOUS, "SR-178 Global-Surveillance System. A Study of a Ferret Facility," ITT Federal Laboratories, Nutley, New Jersey, Final Report, Phase 2, 31 May 1961, Project 79?0, Report No. 78787.68, ASTIA No. AD-323 335L. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4554. APPLETON, E., AND LYON, A. J., "Studies of the E Layer of the Ionosphere. II. Electromagnetic Perturbations and Other Anomalies," J. atmos. terrest. Phys., vol. 21, no. 2-3, pp. ??-99; June 1961. ABSTRACT: Pt I of this paper was devoted to the derivation of various quantitative relations by which the experimentally observed behaviour of the E-layer could be explained in terms of cur-

rent theories of ionized layer formation and variation. It was there shown that two valuable criteria in this connection are (a) the nature of the diurnal asymmetry of $N_m(E)$ when corresponding forenoon and afternoon values are compared and (b) the dependence of the mean level of $N_m(E)$, the layer maximum electron density, on $\cos\chi$, where χ is the solar zenith distance. Departures from the predictions of simple theory were identified by comparing E-layer characteristics observable at different times at a given station, and at the same time at different stations. For example, studies of diurnal asymmetry in f_0E and h'E indicate departures from theoretical predictions; and, moreover, disclose opposite trends in high and low latitudes which are identified as geomagnetic perturbations arising from the motor effect of the Sq system of currents flowing in the E-layer. The same geomagnetic distortion is identified as one main reason why f_0E is not a unique function of $\cos\chi$ under comparable conditions. For examples at a solstice noon, the maximum value of f_0E does not occur at the subsolar point, but on the equatorial side of it. This and other phenomena suggest that, quite generally, the motor effect of the Sq current is to raise f_0E in low latitudes, and reduce it in high latitudes, with reference to its basic value produced by solar radiation. Simple theory suggests that, in the E-layer, N_m should be, substantially, proportional to $(\cos\chi)^{1/2}$ at all times when N_m is not changing too rapidly, as is the case over the greater part of the hours of daylight. Experimental evidence, however, shows that for the diurnal variation at constant latitude, and also for a latitude variation at constant time (such as noon) N_m varies approximately at $(\cos\chi)^{2/3}$. This and other anomalies, such as the considerable variation of f_0E at constant χ, and the anomalous asymmetry observed at low $\cos\chi$, are also discussed. (a-3, b-1, c-1, d-5, e-0, f-See Abstract No. 3653)

4555. BAIN, W. C., "Phase Difference Observations at Spaced Aerials and Their Application to Direction Finding," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, pp. 229-232; May-June 1961. ABSTRACT: The measurement of phase differences at two aerial pairs, each spaced by three to four wavelengths, was used to give mean bearings over periods of three to five minutes on certain transmitters with frequencies near 6 Mc/s. The results showed that site errors had probably been reduced by this system to less than 0.5°, and possibly to 0.2°, which is a value derived on theoretical grounds. The variance of the mean bearings due to lateral deviation was found to be slightly greater than anticipated. However, the results were such as to indicate that the performance of a wide-aperture direction finder should not fall seriously below that which would be expected of it theoretically on the basis of existing knowledge. (a-3, b-1, c-1, d-1, e-0, f-Experimental results)

4556. BEALE, E. M. L., "Brooke Variance Classification System for DF Bearings," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 255; May-June 1961. ABSTRACT: This paper describes the advantages of having an objective classification system for D/F bearings. The Brooke system is described in some detail, and the problems involved in setting up a system on these lines are considered. For many years we used a simple ABCD classification system for HF D/F bearings taken with U-Adcock direction finders. This was not entirely satisfactory for various reasons. The fundamental difficulty was that, although in theory the classification depended in a well-defined way on the consistency of the observed bearings, in practice it was largely subjective. The Brooke Variance Classification System is based on the Ross-Barfield system developed during the Second World War and described by Ross (1947). The present paper is an attempt to describe the system from the point of view of a group that might be considering the introduction of such a system. Section 2 of this paper reviews the reasons for having a bearing classification system. The sources of error in D/F bearings are described briefly in Section 3. The history of the Brooke system is reviewed in Section 4. Section 5 is devoted to a discussion of the problems involved in introducing a similar system into another network. The solutions found for the Brooke system are indicated. Section 6 describes the statistical analysis required to estimate variance components from check bearing data. (a-1, b-1, c-1, d-1, e-0, f-Description)

4557. BEALE, E, M. L., "Estimation of Variances of Position Lines from Fixes with Unknown Target Positions," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 263; May-June 1961. ABSTRACT: Formulas are derived for the estimation of the variances of position lines from fixes with unknown target positions. Two approaches are considered, (1) that presented by Daniels (1951), and (2) an analysis of the squares of the errors in the position lines assuming the target is at the least squares estimate for its position. An important problem in position fixing is to estimate the accuracy of one's position lines. This can be done by assigning a variance to each line, see for example Daniels (1951) and Beale (1961). These variances are usually estimated from fixes on targets whose true positions are known to the analyst. There are two major difficulties about estimating variances from fixes where the true position is unknown: (1) The estimates depend critically on the assumption that errors in different position lines are independent; and (2) The statistical problem is difficult, and any valid method seems to involve a substantial computing effort. In spite of these difficulties, the problem deserves attention, because it is sometimes impossible to set up a satisfactory program of check fixes on known targets. Two approaches are considered in this paper. One follows Daniels (1951), the other is based on an analysis of the squares of the errors in the position lines assuming that the target is at the least squares estimate for its position. Section 2 of this paper presents the basic assumptions common to both these approaches. The next 3 sections are concerned with Professor Daniels' approach to the problem. The approach is presented in general terms in section 3. Specific formulas for the important special case of 4 lines per fix are developed in section 4; and the application of these formulas is considered in section 5. The formulas for the alternative approach are developed in section 6, and their application is considered in section 7. Finally, in section 8 some suggestions are made for an artificial sampling experiment to try out both these approaches. The basic assumptions made in this work are: (1) The earth is flat near the true position; (2) the position lines are straight lines; (3) an error of observation displaces the line parallel to itself; (4) the errors have zero means and are statistically independent; and (5) the errors are normally distributed, and we have rough estimates of their variances. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4558. BOWHILL, S. A., "Diversity Effects in Long Distance High Frequency Radio Pulse Propagation," J. Res. Nat. Bur. Stand., vol. 65D, no 3, p. 213; May-June 1961. ABSTRACT: Spaced antenna measurements are described, made on a 8,600-km path between Colombo, Ceylon and Great Baddow, England, using pulsed radio signals. Simple interpretations in terms of E and F region multiple reflections give good agreement with observed delays for the various echoes. The correlation between echo amplitudes at spaced antennas was found to be much greater for a pulsed signal than for a CW signal, indicating that most of the diversity in long-distance CW transmission arises through phase incoherence between the various orders of reflection. A study of the ionospheric irregularities responsible for the fading of long distance radio signals can best be accomplished by oblique incidence pulse measurements. Previous workers (Wilkins and Kift, 1957; Silberstein, 1958) have shown that very complex modes of propagation may be present on long-distance paths. Detailed theoretical study of these modes has been lacking until recently, when Kift (1960) gave a very detailed method for studying the entire propagation path. This paper describes the basic phenomena involved, and gives some experimental results obtained on 16.16 Mc/s frequency, using transmissions from Colombo, Ceylon, receiver at Great Baddow, England. (a-1, b-1, c-1, d-1, e-0, f-Study)

4559. BOWHILL, S. A., "Statistics of a Radio Wave Diffracted by a Random Ionosphere," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 275; May-June 1961. ABSTRACT: For some purposes, particularly in connection with the study of the random structure of the lower ionosphere, using very low frequencies, it is necessary to find the detailed statistical properties of a random signal diffracting in free space. Mathematical tools for evaluating these parameters have been developed, and are applied in this paper. Allowance is made for the effect of sphericity of the wave incident on the ionosphere, and anisotropy of the irregular variations of signal is permitted. The case of oblique incidence of a wave on the ionosphere is also considered. (a-1, b-1, c-1, d-1, e-0, f-Statistics)

4560. FULTON, F. F., "Effect of Receiver Bandwidth on the Amplitude Distribution of VLF Atmospheric Noise," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 293; May-June 1961. ABSTRACT: The distribution function of envelope voltage for short samples of atmospheric radio noise as received by a communications receiver in the VLF range always shows a marked departure from that obtained for Gaussian noise. If it is considered that this departure is caused by strong noise pulses which do not overlap in time, the effect of changes in the receiver bandwidth on the observed distribution function can be deduced by consideration of the changes in the receiver impulse response. A transformation can be obtained which gives an excellent approximation to the change in a mathematical representation of the distribution function in the range of probabilities below 1 percent. Empirical relationships are suggested which give useful estimates of the change in the distribution function over the total range of probabilities. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4561. GALEJS, J., "Excitation of VLF and ELF Radio Waves by a Horizontal Magnetic Dipole," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 305; May-June 1961. ABSTRACT: The VLF and ELF modes excited by a horizontal magnetic dipole (vertical loop) in the spherical

shell between a finitely conducting earth and an isotropic sharply bounded ionosphere are shown to have a nearly transverse magnetic character. The modes are similar to those of a vertical electric dipole. With the exception of the zero order mode, the propagating modes excited by the magnetic dipole are of slightly higher amplitudes, provided that the far fields of the horizontal magnetic and vertical electric dipoles are equal over flat earth in the absence of ionosphere. The transient fields generated by a current step in the magnetic dipole are in the first approximation similar to the fields generated by a current impulse in a vertical electric dipole. Response of the zero order mode of the magnetic dipole has been calculated. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4562. GETHING, P. J. D., "Influence of Ionospheric Conditions on the Accuracy of High Frequency Direction," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, pp. 225-228; May-June 1961. ABSTRACT: The accuracy of fixes obtained by hf direction finding stations was examined by means of a dispersion factor computed for each fix; this factor is a measure of the consistency of bearings taken from different stations on the same transmission. It is shown that the accuracy is significantly lower during times of ionospheric storms than at times when no storm occurred, and that the effect of the storm is mainly on fixes involving F2 layer propagation. (a-2, b-1, c-1, d-1, e-0, f-Study)

4563. GRIMSDALE, R. L., AND BARRACLOUGH, M., "A Cathode-Ray Tube Output for a Digital Computer," J. Brit. Instn. Radio Engrs., vol. 21, no. 6, pp. 497-501; June 1961. ABSTRACT: The unit gives a visual display on one cathode-ray tube and has a second tube which is equipped with an automatic camera controlled directly by the computer. The device may be used for curve plotting with a resolution of 256 X 256 or for alpha-numeric display. In the latter case the computer can be programmed to display a variety of different formats and high output rates are possible. (a-3, b-1, c-1, d-5, e-0, f-Description)

4564. HAGN, G. H., NIELSON, D. L., AND SMITH, F. H., "Backscatter Literature Survey," Stanford Research Institute, Menlo Park, California, Project No. 3311; June 1961. ABSTRACT: This survey includes about 400 titles and abstracts. (a-3, b-3, c-1, d-1, e-0, f-Bibliography)

4565. HAYDEN, E. C., "Instrumentation for Propagation and Radio Direction Finding Measurements," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 253; May-June 1961. ABSTRACT: Limitations imposed on radio direction-finding systems are discussed in terms of a generalized representation of such systems in the form of a block diagram. Factors affecting these limitations include: (1) considerations of signal-to-noise ratio in the early part of the system, (2) receiver bandwidth requirements for adequate selectivity, (3) width of spectrum generated by prereceiver encoding and computing processes, (4) restriction to linear processes in multisignal portions of the system, and (5) availability of operational devices suitable for use in low-signal-level portions of the system. (a-1, b-1, c-1, d-1, e-0, f-Instrumentation)

4566. HAYDEN, E. C., "Propagation Studies Using Direction-Finding Techniques," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 197; May-June 1961. ABSTRACT: The most persistent and difficult problem in radio direction finding has been measurement of the direction of arrival of an incident signal field under circumstances where multipath propagation is possible. In the HF band, the ionosphere plays a predominant role in the propagation of radio waves, and in this region several mechanisms exist which promote splitting of a radio signal into numerous components. It would be of value to have a more thorough knowledge of the characteristics of the individual signal components. In this paper two techniques are described for the study of multicomponent signals. One involves use of pulse transmissions to effect "time-of-arrival" resolution; the other involves use of a highly directive antenna system to effect "direction-of-arrival" resolution. Results of the application of these two techniques in specific instances are presented. (a-1, b-1, c-1, d-1, e-0, f-Investigation and analysis)

4567. LINDER, I. W., "Resolution Characteristics of Correlation Arrays," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, pp. 245-252; May-June 1961. ABSTRACT: Aerial arrays which are designed to utilize correlation techniques can result in directivity patterns with very narrow beamwidth. However, analysis of resolution capabilities of these arrays indicates a marked change in expected performance in the presence of two or more signal sources. These effects are analyzed for single frequency signal sources and for randomly varying signal sources. It is shown that optimum results occur when the nonlinear processing of the aerial voltages is limited to a single multiplication. Under these conditions, the correlation array has a directivity equivalent to that of a linear array of twice the length. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4568. LINDSAY, W. J., AND HEIM, D. S., "Design for Spinning Goniometer Automatic Direction Finding," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, pp. 237-243; May-June 1961. ABSTRACT NO. 1: Discusses some aspects of instrumentation design in making a spinning goniometer radio direction-finder essentially automatic in operation. Also discussed is the application of narrow band synchonous post-detection filtering for improving the bearing sensitivity. ABSTRACT NO. 2: It has been demonstrated that one may partially automate and otherwise improve the operation of SGDF with respect to certain prescribed criteria with rather simple and inexpensive methods. One must of course keep in mind what the particular objectives for the system are and the resulting advantages to be gained by making certain changes and the price that sometimes must be paid to make those changes. (a_1-2, a_2-1, b-1, c-1, d-1, e-0, f-Description)

4569. SILBERSTEIN, R., "Research at the National Bureau of Standards Applicable to Long-Distance Location and Direction-Finding Problems," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, pp. 233-235; May-June 1961. ABSTRACT: Research pertaining to radio-location and direction-finding problems conducted at the National Bureau of Standards since 1941 includes evolution of a technique for determining polarization error, study of non-great-circle bearings, the development of a rapid-scanning directional aerial, and the development of Loran-C with its precision timing capabilities. (a-2, b-1, c-1, d-1, e-0, f-Survey)

4570. SMYTH, J. B., "Space Analysis of Radio Signals," J. Res. Nat. Bur. Stand., vol. 65D, no. 3, p. 293; May-June 1961. ABSTRACT: The radio antenna is viewed as a space frequency filter with an output just equal to the convolution of its transfer function with the radio field illuminating its aperture. An equivalent uncertainty principle limits the accuracy with which the spatial distribution of the radio field may be determined. The radio field generated by an antenna is distorted in passing into the ionosphere, generating new space frequencies which is the information contained in the field at the receiving antenna. The energy diffracted into the different orders will appear to arrive from different directions, and the angle of arrival for a given order will be a function of the radiofrequency. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4571. VERMEULEN, J., BOERSTRA, J. H., AND STAM, F., "Dimple Sea Trials 1961," Laboratorium Elektronische Ontwikkelingem voor de Krijgsmacht, Report No. G 1253/574d, ASTIA No. AD-329 758, 7 June 1961. ABSTRACT: Not available. (a-4, b-3, c-8, d-12, e-0, f-0)

4572. SPARKS, P. V., "Servo Filter and Gain Control," Electronics, vol. 34, no. 23, pp. 110-113; 9 June 1961. ABSTRACT: Synchronous servo filter at receiver output of T-12 automatic direction finder separates servomotor drive voltage from voice frequencies; automatic gain control provides uniform receiver response over wider range of input levels without clipping signal at high modulation levels. (a-3, b-2, c-1, d-1, e-0, f-Description)

4573. TRAVERS, D. N., "Second Interim Report: The Beverage Direction Finder; Interim Development Report for a Study Technique to Produce a High Frequency Land-Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, Contract NObsr 85364; 15 June 1961. ABSTRACT: This report describes survey and installation work on two Beverage arrays which were briefly mentioned in the first interim report. The report also includes some preliminary results of data accumulated on the 360° Beverage array with respect to antenna impedance, velocity ratio, and patterns for vertical polarization. No bearing accuracy data is available as yet. Site survey and construction work on the 360° Beverage array has been completed. This array has been placed in operation with a simple temporary commutating switch and a DAQ receiver and indicator. In addition measurements of various parameters have been made on a selected antenna of this array. Patterns for difference connections of two Beverage antennas have been measured. Construction of the large sector Beverage array is now underway and is approximately 30 per cent complete. It is expected that this array will be placed in operation around the first of August. Design work on a suitable commutator for both arrays has been conducted on two types of circuits. An inductive commutator consisting of ferrite

toroidal core stators is in the initial stages of investigation. A second commutator using diode switches activated by a transistorized ring counter is also under construction. Completion of these commutators is expected by November 1961. In the meantime, simplified nonoptimu low-cost commercial switches are being used as test commutators. Preparations are complete for initial tests of three Beverage antennas with a phase and gain matched twin channel receiver. The current delivery schedule for this receiver indicates that these tests can be performed sometime after 1 September 1961. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4549)

4574. ANONYMOUS, "Anti-Radiation Techniques," Bendix Corporation, Detroit, Michigan, Final Report, Contract No. AF 33(616)6872 Project 4078, ASTIA No. AD-323 841; 16 June 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4575. LIPTON, B., "Correction Factor for Pitch and Roll to Obtain True Bearing and Depression Angle of Radio and Acoustic Signals Received from a Buoy," Naval Ordnance Laboratory, White Oak, Maryland, Technical Report No. NOLTR 61-36, ASTIA No. AD-401 531; 22 June 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4576. BOWIE, D. M., GROSS, B. R., ET AL., "Investigation of Flush-Mounted Antennas," Aero Geo Astro Corporation, Alexandria, Virginia, Technical Note No. 2, Contract No. AF 30(602)2386, RADC TN 61-74, ASTIA No. AD-262 472; 28 June 1961. ABSTRACT: Three areas were investigated: (1) corrugated surfaces with barriers a wavelength in height, (2) corrugated surfaces with barriers one-quarter wavelength in height, and (3) interferometer height-finding techniques. Under the first investigation the effect of a coarse corrugated structure having large, widely spaced barriers on vertically polarized waves was examined. Patterns are shown indicating the wave was not bound by the medium. The second investigation was initiated using a corrugated surface with adjustable spacing with barriers of height less than one-quarter wavelength. Results show, for spacing from 0 to 1/2 wavelength, a reduction in phase velocity and for spacing from 1/2 to 3/4 wavelength, phase velocity greater than the free-space value indicated. An experiment for demonstrating the technique of the interferometer height-finder was planned, which makes use of two radiation sources at a scale frequency at approximately 500 mc. This region makes it possible to extract phase information directly from the received signal and avoids the use of signal conversion techniques, which may present phase distortion errors. (a-1, b-3, c-1, d-1, e-0, f-Investigation and study report)

4577. DESTEFANO, J., "Direction Finder Group AN/TLA-9, Formerly OA-(XE-1)/VRD," Litton Systems Inc., College Park, Maryland, Quarterly Progress Report No. 4, Contract No. DA 36-039-sc-84961, ASTIA No. AD-261 678; 30 June 1961. ABSTRACT: Efforts were continued on the design of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearings of electromagnetic signals in the frequency range of 1.0 to 10.75 kmc. Work was continued on the mechanical and electrical assembly with all electro-mechanical assemblies completed. Except for the low voltage power supply module, the power supply unit was made ready for final electrical and environmental testing. Antenna reflector and feed structures require redesign to meet vibration requirements. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4516)

4578. ALTSHULER, E. E., "Traveling-Wave Linear Antenna," Trans. IRE, vol. AP-9, no. 4, pp. 324-329; July 1961. ABSTRACT: Essentially traveling wave distribution of current can be produced on linear antenna by inserting resistance of suitable magnitude 1/4 wavelength from end of antenna; input impedance of antenna remains essentially constant as function of antenna length, and varies only slightly over 2-to-1 frequency band; directional properties are relatively insensitive to change in frequency. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4579. FLIGHTS, R. C., VICKERS, T. K., AND MILLER, W. E., "A Study of Display Systems for Use in the Augmented 4-Wheels Project," Hazeltine Technical Development Center, Inc., Indianapolis, Indiana, Final Report, AFCRL-753, Contract No. AF 19(604)7986, ASTIA No. AD-266 529; July 1961. ABSTRACT: The results are presented of an investigation of available display equipment for possible use in an air transportable, air traffic control and communication system. Various display techniques and associated equipment are analyzed with respect to the requirements of this system. Specific equipments, in the following categories, are described and analyzed: (1) horizontal PPI console, (2) small plane position indicator, (3) AZ-EL indicator, (4) symbol generation system, and (5) method of displaying flight plan data. One particular display equipment from each of the above categories is recommended. (a-1, b-3, c-1, d-1, e-0, f-Study report)

4580. CHEN, KUN-MU, AND KING, R. W. P., "A Loop Antenna Coupled to a Four-Wire Line," Instn. Electrical Engineers, Monogram No. 462 E; July 1961. ABSTRACT: A loop antenna coupled electromagnetically to a four-wire transmission line is studied theoretically and experimentally in terms of two mutually perpendicular two-wire lines that carry currents that are 90° out of phase. The size of the loop at which resonance occurs is determined. The zero-order and first-order solutions of the current distribution are evaluated, and it is found that at resonance the induced currents in the loop due to each two-wire line oscillate in a dipole mode of the loop. The currents induced by the four-wire line circulate as a travelling wave. The radiation field pattern is also evaluated. The square loop is studied first; it is later shown that the circular loop closely resembles the square loop. An array that consists of many loop antennae coupled electromagnetically to a four-wire transmission line may be expected to have a very high gain with circularly polarized radiation. (a-1, b-1, c-1, d-5, e-0, f-Description)

4581. LEWIN, L., "Diversity Reception and Automatic Phase Correction," Proc. IEE, Paper No. 3584E; July 1961. ABSTRACT: The interference between the direct ray and a ground-reflected ray gives rise at the receiver of a communication link to a sinusoidal field pattern in the vertical plane consisting of nodes and maxima. The position and pattern wavelength of this field depend on the receiver and transmitter heights and spacing and on propagation conditions via an effective curvature parameter, C. This parameter varies in time, and is the cause of most fading at a single aerial. Its upper limit, which may be as high as 2.5 for a small percentage of the time, determines minimum aerial heights for line-of-sight transmission under extreme conditions. C is normally about 3/4. Its range of variation determines the optimum spacing of a pair of diversity aerials, and suitable design formulae are given. Experiments using a pair of mirrors, a varying transmitter frequency, and photographs of oscillograph traces indicate an extreme lower value of C over water of -1.5. A moving-film display shows that conditions can vary rapidly from minute to minute, although at other times the display is steady for hours at a time. An automatic phasing junction has been designed for insertion in the feed from two diversity aerials, the drive for the phasing element being taken from the receiver. A combined signal, nowhere smaller than the greater of the received signals, is obtained from the combining unit, and when the diversity spacing is chosen with regard to the extreme values of curvature obtained on the path, an excellent overall response is ensured. Some preliminary figures are given for the performance of an improved combining network and phase control apparatus operating in conjunction with a height-diversity microwave system over a 69-mile overwater path. (a-3, b-1, c-1, d-5, e-0, f-Description)

4582. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Quarterly Progress Report No. 4, Contract No. DA 36-039-sc-84966, ASTIA No. AD-266 667; July 1961. ABSTRACT: Major effort was devoted to the completion and preparation for delivery of equipments to automatically encode tuning instructions from a master R-390/URR HF radio receiver of a direction finding network. The investigation of semiautomatic bearing read-out, and the preliminary processing of field data were continued and 2 tentative solutions to these problems were formulated. (a-1, b-3, c-1, d-1, e-511, f-See Abstract No. 4525)

4583. ANONYMOUS, "The Role of USASA in Support of Target Acquisition for the Army. Vols. 1 and 2," Army Security Agency Board, Arlington, Virginia, Final Report, Project No. 60/P94/C24, in cooperation with HRB-Singer, Inc., State College, Pennsylvania, ASTIA Nos. AD-326 158 and AD-326 159; 1 July 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1 e-0, f-0)

4584. TRAVERS, D. N., AND COOPER, R. E., "Third Interim Report: The Beverage Direction Finder; Interim Development Report for a Study Technique to Produce a High Frequency Land-Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, Contract No. NObsr-85364; 15 July 1961. ABSTRACT: Installation of both Beverage arrays described in earlier reports is not complete. Installation of receiving equipment for tests of the 360° Beverage antenna is complete. Installation of receiving equipment at the 72° sector array is approximately 50 per cent complete. Preparations for pattern and impedance mea-

surements on the sector array are underway and it is expected that initial data will be completed by 15 August. Measurements will be performed on azimuth patterns and bearing accuracy during August and September. Design work on a suitable commutator for both arrays has continued using both inductive and diode switching circuits. Initial test results have been obtained on the inductive commutator. Construction of the diode switching system has progressed to the completion of a 36 section ring counter. Some additional initial testing has been performed on low-cost nonoptimum commercial switches. A literature survey on the wave tilt phenomena has progressed to the selection of published equations which can be used to calculate three dimensional patterns for the Beverage antenna which take into account surface wave and the electrical constants of the earth. From these analyses, it is believed that some qualitative estimate of the effect of downcoming angles on the Beverage antenna can be obtained. It is also apparent tha the same analyses can yield procedures for calculating the effective height of the Beverage antenna. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4573)

4585. BAILEY, A. D., HAYDEN, E. C., AND DYSON, J. D., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for Use in the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory, Final Report, Contract No. DA 36-039-sc-84525, ASTIA No AD-267 087, 31 July 1961. ABSTRACT: The purpose of the contract has been to conduct studies and investigations which will lead to the design of a radio direction finding system for the MF-HF-VHF range in accordance with confidential Signal Corps Technical Requirements Nr SCL-5620 dated 11 March 1959. The work has been done under four tasks entitled: (1) Propagation Research, (2) RDF Systems Engineering, (3) Data Handling and Presentation, and (4) Data Analysis, Interpretation, and Evaluation. The final report summarizes the work that has been completed on the first three tasks as follows: (1) Instrumentation for the Propagation Research Task has been completed. (2) A wide-base amplitude comparison system using the Beverage Antenna as the directive element has been constructed. (3) Radio direction finder systems of the wide-base phase comparison type have been proposed as having the properties which are needed to meet certain of the specifications. (4) Certain novel techniques in radio direction finding have been developed. Where possible, significant results and recommendations are given in sufficient detail to permit their duplication by others versed in the area of specialization. (a-1, b-3, c-1, d-1, e-282, f-Summary report. See Abstract No. 4535)

4586. HARRISON, C. W., "Antenna Coupling Error in Direction Finders," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, pp. 363-369; July-August 1961. ABSTRACT: Aerial coupling or scattering in an interferometer-angle-measuring system consisting of two identical base-loaded quarter-wave vertical aerials over a perfectly conducting earth is investigated. A curve is supplied for the error in angle as a function of aerial spacing for an incident vertically polarized electric field arriving in the plane of the aerials when the ratio of aerial length to radius is 75 and the base loads are resistors of 50 ohms. (a-3, b-1, c-1, d-1, e-0, f-Investigation)

4587. HARRISON, C. W., "Radio-Frequency Shielding of Cables," J. Amer. Soc. Naval Engrs., vol. 73, no. 3, pp. 529-533; August 1961. ABSTRACT: Minimization of RF pickup of cabling by use of shields and other means; diagrams and text refer to coaxial cable loop antenna with load, sleeve stub and top loaded sleeve stub antenna receiving systems, resistance loaded electric dipole, circuit using battery connected to resistor by balanced line, circuit using conventional shielding, metallic cylinder, and composite circuit. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4588. LAWRENCE, R. S., JESPERSEN, J. L., AND LAMB, R. C., "Amplitude and Angular Scintillations of the Radio Source CYGNUS-A Observed at Boulder, Colorado," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, pp. 333-350; July-August 1961. ABSTRACT: Variations in the apparent flux and position of the radio source Cygnus-A were recorded at 53 and 108 megacycles per second using a two-element, phase-sweeping interferometer located at Boulder, Colo. An ionospheric sounder operating at Ellsworth, Nebraska, provided, for a few hours each day, simultaneous vertical-incidence measurements on the ionosphere at its intersection with the line of sight from Boulder to the radio star. Amplitude scintillations observed at Boulder over a twelve-month period are compared with ionograms taken at Ellsworth. Positive correlation is found between amplitude scintillations and spread F, while no significant correlation is found with sporadic E. Detailed analysis of the scintillations indicates that the probability distribution of the amplitude can be represented by the Rice probability distribution function. The zenith-angle dependence of the amplitude scintillations does not agree with a theory based upon isotropic ionospheric inhomogeneities. The root-mean-square value of angular scintillations is proportional to the square of the wavelength, in accord with a theory of diffraction by ionospheric irregularities. Comparison of angular scintillations with amplitude scintillations indicates that, for elevation angles of 15° to 50°, the region of the ionosphere responsible for scintillation lies near the border between the Fresnel and Fraunhofer diffraction regions for both frequencies. Slow, irregular angular variations are commonly observed in the daytime at both frequencies. These variations are attributed to lens-like ionospheric irregularities having dimensions as large as 200 kilometers. (a-1, b-1, c-1, d-1, e-0, f-Propagation experiment)

4589. LAWRENCE, R. S., JESPERSEN, J. L., AND LAMB, R. C., "Digital Methods for the Extraction of Phase and Amplitude Information from a Modulated Signal," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, pp. 351-356, July-August 1961. ABSTRACT: A description is given of three digital methods which have been used to recover amplitude and phase information from a modulated sinusoidal signal sampled at equal intervals of not more than one-sixth of a period. The first method, the "zero-crossing" method, is economical of computer time and, for modulation which is not too deep and does not contain frequencies near the carrier frequency, accurately recovers the phase and amplitude modulation. The second method, the "filter" method, is more laborious but it gives better accuracy and will operate with deeper and more rapid modulation. The third method, a statistical approach, will work with severely overmodulated signals, but it yields only a statistical summary of the modulation. The methods were designed specifically for analysis of radio-star scintillation records but they may be applied to many other modulated signals. (a-3, b-1, c-1, d-1, e-0, f-Description)

4590. ROSS, J. M., AND KIRCH, J. E., "A Few Observations of the Perturbations in the Phase of the Low-Frequency Ground Wave," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, p. 393; July-August 1961. ABSTRACT: The effects of anomaly-producing terrain features on the phase of the low frequency ground wave were measured in a nearly idealized environment to confirm theoretical predictions: Results for an isolated butte gave good correlation with the theoretical model. In most cases the mean value of the phase perturbation approached zero. Low frequencies have been used for radio navigation for some time with excellent results obtained over water, and in the air. However, in use on the ground, disturbances caused by cultural and terrain features, and changes in conductivity cause errors in position. Many tests (Bateman, 1950, 1951; Schneider, 1952; Pressey, 1956) of various systems have been conducted and considerable information is available in unpublished reports for these systems on the type of cultural and terrain features that cause propagation disturbances. However, little information is found of sufficiently general nature to be applied or extended to other systems. In addition, propagational theory is usually developed only for idealized cases, so that measurements are necessary to determine the limitations of idealized cases or mathematical models. (a-1, b-1, c-1, d-1, e-0, f-Observation report)

4591. VOGLER, L. E., "Smooth Earth Diffraction Calculations for Horizontal Polarization," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, p. 397; July-August 1961. ABSTRACT: This paper presents a simplified method of determining the attenuation relative to free space in the so-called far diffraction region for horizontally polarized radio waves diffracted over a smooth spherical earth. A criterion is given which permits use of the method not only for far beyond line-of-sight paths but, in many practical situations, at line-of-sight or even slightly within. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4592. VOLLAND, H., "Comparison between Mode Theory and Ray Theory of VLF Propagation," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, p. 357; July-August 1961. ABSTRACT: It is shown that the field strength according to mode theory and ray theory in the VLF band are derivable from the same expression of the original vector potential, and the result of one theory is the analytic continuation of the other one in another range of convergence. In fact, both ranges of convergence overlap. Estimates of these ranges are made and an example shows that within this overlapping region (between distances of 300 and 2,000 km) both theories give the same result. Using this fact calculations of frequency spectra are possible which in the case of a white noise dipole show some similar features to measured frequency spectra of lightning discharges. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4593. WAIT, J. R., "On the Theory of Mixed-Path Ground-Wave Propagation on a Spherical Earth," J. Res. Nat. Bur. Stand., vol. 65D, no. 4, p. 401; July-August 1961. ABSTRACT: The problem formulated

concerns the mutual impedance between two vertical dipole antennas A and B located near the surface of a spherical smooth earth. The path between A and B is made-up of a number of homogeneous segments where the surface impedance is constant. Various formulas are developed, for two- and three-section paths, which are suitable for computation. Certain limiting cases are discussed and where possible a physical interpretation of the results is given. Comparisons with previous work are made. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4594. HEBBERT, R. S., AND HUG, E. H., "Radio Direction Finding over a Troposcatter Path," Naval Ordnance Lab., White Oak, Maryland, Report No. NOLTR 61-76, ASTIA No. AD-276 507; 1 August 1961. ABSTRACT: Measurements of fluctuations (from the great circle path to a transmitter) in the bearing estimates of a microwave interferometer were made at 910 mc with the transmitter located beyond the horizon. A general description is presented of the apparatus and some experimental results. The standard deviations of the bearing estimates were typically of the order of 1/10 degree for averaging times longer than 10 seconds, larger fluctuations being observed on over-land than over-water paths due to asymmetries in the cross-path geometry coupled with humidity differences. (a-1, b-3, c-1, d-1, e-0, f-Description and experimental results)

4595. LOVELY, H. E., SHERRILL, W. M., AND TRAVERS, D. N., "Progress on the Development of the Non-Rotating Coaxial Spaced Loop Direction Finder for Vertical Polarization, Single Channel Component Resolution Direction Finding, and Evaluation of the DFG-4 Doppler Direction Finder," Southwest Research Institute, Report No. 4, Contract NObsr-85086; 1 August 1961. ABSTRACT: The development of a Nonrotating Coaxial Spaced Loop for use with a twin channel receiver is reported. Fabrication and installation of an eight-loop air core design are reviewed. The preliminary engineering design of a ferrite core model is presented. Preparations and initial test results for field evaluation for the component resolution D/F technique are reported. The modification and concentric mast installation of the DFG-4 Doppler Antenna are reported. (a-1, b-3, c-1, d-1, e-1000, f-Development report)

4596. ANONYMOUS, "Radio Location Techniques," Ohio State University, Research Foundation, Progress Report No. 2, Phase 2, Contract No. AF 30(602)2214, Report No. RADC TN 61-108, ASTIA No. AD-324 967; 4 August 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4546)

4597. ARCHBALD, R., HOFFMAN, D., ET AL., "Special Purpose Analysis Techniques," New York University, College of Engineering, Final Report, Contract No. DA 36-039-sc-84968, ASTIA No. AD-269 083; 31 August 1961. ABSTRACT: An experimental model of an automatic direction finder was assembled. A description is given of the antenna and receiver sections of the system. The method used to calibrate the processing and display units is shown. Field tests, to determine the performance of the system, are described and the results evaluated. Progress is included which was made on the experimental program for determining the feasibility of using a general purpose digital computer for signal analysis problems. A computer program for pulse signal analysis using the laboratory model of the computer-receiver system was prepared. (a-1, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 4515)

4598. MONSER, G., AND CECIL, J., "Design and Development of Antenna Group for Direction Finder Sets AN/PRD-7( ) and AN/PRD-8," American Electronic Laboratories, Inc., Colmar, Pennsylvania, Quarterly Progress Report No. 1, Report No. 60042-1, Contract No. DA 36-039-sc-84981, ASTIA No. AD-266 691; 31 August 1961. ABSTRACT: Research is concerned with the design and construction of a man-portable antenna group for direction finder sets AN/PRD-7( ) and AN/PRD-8( ). The group, when used in conjunction with a radio receiver and an azimuth indicator, will constitute a complete direction finder. Initial design investigation is described through completion of the design plan for the antenna group covering 100-200 mc, and 200-1,000 mc bands. A sleeve dipole antenna with a unique sensing arrangement is used for the low band, and a pyramidal zig-zag log-periodic antenna is used for the high band. The design plan delineates in detail the proposed system. (a-1, b-3, c-1, d-1, e-413, f-Progress report)

4599. ADAMS, A. T., KALAFUS, R. M., PALAIS, J. C., AND SIMANYI, A. I., "Study and Investigation of a UHF-VHF Antenna," University of Michigan, Department of Electrical Engineering, Cooley Electronics Laboratory, Report No. QPR No. 5, Contract No. AF 33(616)7180; September 1961. ABSTRACT: Several theoretical and experimental problems were studied during this period. The study of diffraction of a plane wave by a ferrite sphere was extended to include a metal sphere enclosed within and concentric with the ferrite sphere. Computer results showed that resonant frequencies were changed slightly with the addition of the metal sphere. A study of plane-wave diffraction by a longitudinal magnetized ferrite cylinder was begun. A computer program is being prepared to evaluate the fields for various values of μ and t. A shielded, balanced-loop antenna loaded with ferrite material was analysed, showing that resonance of the loop could be maintained over a broad range of frequency. Radiation patterns from a ferrite-filled waveguide were evaluated on the computer, showing that with the use of ferrite loading the size of a waveguide radiator can be reduced by the factor $\sqrt{\mu_r \epsilon_r}$ without substantial change in radiation pattern. The coaxial cavity equipment used to measure complex permeability and permittivity was improved to an accuracy of about 10% in ϵ', μ' and about 20% in ϵ'', μ''. (a-1, b-3, c-1, d-1, e-388, f-Study)

4600. JEAN, A. G., TAGGART, H. E., AND WAIT, J. R., "Calibration of Loop Antennas at VLF," J. Res. Nat. Bur. Stand., vol. 65C, no. 3, pp. 189-193; July-September 1961. ABSTRACT: A technique and the equipment used for the precise determination of field strength of signals received from vlf transmitters is described. The equipment, which is battery-operated, contains provisions for the reception of vlf signals and the generation of standard fields to an accuracy of 5%. Both the receiving and transmitting aerials are loops. The field strength is determined in terms of a quasi-static magnetic field with the two loop aerials positioned coaxially at a spacing of approximately two meters. Although the technique was developed for use at vlf, it can be used at higher frequencies for calibrating loop aerials, generators, and voltmeters, and for determining effective heights of aerials, or similar applications. (a-2, b-1, c-1, d-1, e-362, f-Description)

4601. KUNZE, H., AND RATTEI, H., "Terrain-Dependent Bearing Errors and Their Avoidance with V.H.F. Rotating Adcock," Telefunken Ztg., vol. 34, pp. 215-220; September 1961. ABSTRACT: Such errors are generally caused by reflection from nearby objects. Curves of bearing errors against frequency are shown for different sitings of the direction finder in the neighbourhood of woods and hilly country, these errors being consistently greater for vertical than for horizontal polarization. A table gives the minimum safe distance between the direction finder and such reflecting objects as eht lines, railways lines and woods. (a-2, b-2, c-4, d-4, e-0, f-0)

4602. MCLEISH, C. W., AND BURTNYK, N., "The Application of the Interferometer to H.F. Direction-Finding," Proc. IEE, vol. 108, Part B, no. 41, p. 495; September 1961. ABSTRACT: The measured performance of an interferometer system for direction-finding in the hf band is described. A considerable reduction in bearing error compared with a narrow-aperture (Adcock) system is obtained in the presence of ground reradiators and fluctuating wave-interference fields. A standard deviation of about 1.2° has been obtained with a 400 ft interferometer on sky-wave transmissions in the 5-25 Mc/s band. Radio direction-finding in the ordinary sense implies finding the direction of discrete transmission sources. The measurement is based on finding either the mean direction of arrival of wave energy or the direction of arrival of the predominant mode. Two errors appear, one due to the uncertainty of determining the direction of arrival on the above basis, and the other to path deviations which make the direction of arrival different from the true direction of the transmitter. In the hf band (3-30 Mc/s) deviations of long-distance paths are usually correlated over large distances (tens of kilometres) so that it is impractical to consider means of reducing this error within a single direction-finder. On the other hand, the interference effects of angular dispersion of the received energy are correlated over distances proportional to wavelength and the cosecant of half the angular spread of interfering waves. Therefore it is usually possible to reduce wave-interference error by sampling the field at two or more points separated in space by several wavelengths. The theoretical performance of wide-aperture systems in wave-interference fields is discussed by Bain. A further consideration is the effect of time variations on the interference field and on the path deviations. Although this is negligible for fixed ground-wave paths, time variation may be important for ionospherically reflected paths. In the latter case, substantial reduction in wave-interference error can usually be obtained in times of the order of a minute, whereas path-deviation errors are sometimes correlated over periods of hours. Therefore in designing a direction-finding system, one should consider the relative advantages of antenna aperture and time of observation in the reduction of wave-interference errors. The purpose of the paper is to show experimentally the performance of a 2-element interferometer for ground- and sky-wave reception and to compare it with the performance of a narrow-aperture Adcock system. In the sky-wave test, lateral deviation and wave-interference errors are separated statistically and the relative

advantage of the interferometer over the Adcock is demonstrated. Section 6 contains a brief discussion on the problem of ambiguity resolution of the multi-lobed pattern of the interferometer. (a-1, b-1, c-1, d-5, e-454, f-Description)

4603. RANTZ, R. D., "CSR 110 Albatross Aircraft Technical Evaluation," Central Experimental and Proving Establishment, Canada, Report No. CEPE-1587, ASTIA No. AD-269 957; September 1961. ABSTRACT: A technical evaluation is reported of the Doppler and Sarah installations, the Tacan antenna system, and also the VHF/D/F facility of the Albatross aircraft, equipped for search and rescue duties. The results of the tests showed the Doppler Navigation System and Sarah installation to be satisfactory. One interference problem exists with the Sarah installation, but this can be solved by proper operating procedures. The VHF/D/F facility is satisfactory for detecting and homing purposes, but not as a method of obtaining bearings to a station. The range of this last facility is also limited. The Tacan antennae radiation patterns show a fairly omni-directional coverage. However, additional tests must be carried out to check for bearing accuracy and range reception. (a-1, b-3, c-1, d-7, e-0, f-Evaluation report)

4604. TROOST, A., "The Telefunken Development of H-Adcock Direction Finders in the H. F. and V. H. F. Bands," Telefunken Ztg., vol. 34, pp. 209-214; September 1961. ABSTRACT: The development of this direction finder in the hf band is first reviewed followed by brief mention of the use and properties of the U-type in the hf band. In the vhf band the H-type is preferably made rotational since one pair of dipole elements alone is required and a goniometer can be dispersed with. Furthermore, it can easily be designed for broad-band use. With this single dipole pair compensation for unbalanced voltages betw. element can be obtained with an adjustable differential transformer. Sense determination is effected by means of a 2-terminal network connected to one of the elements. (a-2, b-2, c-4, d-4, e-0, f-Survey)

4605. ANONYMOUS, "Investigation of Techniques for Deception of Frequency Agility Search Radars," Lockheed Aircraft Corporation, Marietta, Georgia, Engineering Report No. 2, Report ER-5366, Contract No. AF 33(616)7997, ASTIA No. AD-325 161; 15 September 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4606. KALMUS, H. P., "A New Guiding and Tracking System," Diamond Ordnance Fuze Laboratories, Report No. TR-974, 20 September 1961. ABSTRACT: A new application of the near-field theory is described which permits determination of the relative bearing of one object with respect to another by a simple phase measurement without an additional reference signal. The same instrument is used to measure distance between the objects. The angle indication is independent of distance. The guidance method described herein was designed originally to aid vehicles to follow one another. Many situations in which it is desirable to determine the relative bearing and range of one moving object with respect to another should prove amenable to the same technique. (a-1, b-3, c-1, d-1, e-581, f-Description)

4607. DESTEFANO, J., "Direction Finder Group AN/TLA-9, Formerly OA(XE-1)/VRD," Litton Systems, Inc., College Park, Maryland, Report No. 5, Contract No. DA 36-039-sc-84961, ASTIA No. AD-265 553; 30 September 1961. ABSTRACT: Efforts were continued on the design of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearing of electromagnetic signals in the frequency range of 1.0 kmc to 10.75 kmc. Pedestals A and B were completely checked out, mechanically and electrically, with satisfactory results. The video processing circuits and the servo circuitry were debugged and intra circuit pickup removed. Problems of inter circuit pickup still exist. The antenna and radome assemblies were received as were the high and low voltage power supply modules. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4577)

4608. ALFANO, W. A., AND PHILLIPS, C. E., "HF Antenna Study for Project VELA," Eleventh Annual Symposium on USAF Antenna Research and Development Program, University of Illinois; October 1961. ABSTRACT: In connection with Project VELA (techniques for the detection of nuclear explosions at high altitudes and in space), Granger Associates has been awarded contract by the Air Materiel Command, U. S. Air Force, for study and design of a suitable antenna system for use with a high-frequency (3 - 30 Mc) backscatter radar detection system. Tentative antenna characteristics are listed as follows: (a) Operate from 3 to 30 Mc without deterioration of performance, (b) Ability to scan 360 degrees in azimuth in about one minute, (c) Present a constant load to the transmitter with change in frequency, azimuth and elevation, (d) Side lobes reduced to the extent that possible return from directions is virtually eliminated, (e) Ability to control the elevation angle of the major lobe, from horizontal to approximately 45 degrees, believed not necessary, (f) Transmitter antenna should be able to withstand 10 kw average power with peak power of 0.5 megawatt. Pulses will be about one millisecond long and prf about 5 to 20 per second, (g) Be of reasonable size and complexity. A study of system requirements has been conducted to establish more precisely the antenna parameters such as azimuth and elevation beamwidths of the transmitting and receiving antennas. Site requirements have also been considered during the initial phase of the investigation. Various antenna configurations, including arrays of logarithmically periodic antennas have been considered and results of the evaluations are presented. (a-1 and 4, b-3, c-1, d-1, e-0, f-Study report)

4609. JEAN, A. G., MURPHY, A. C., WAIT, J. R., AND WASMUNDT, D. F., "Observed Attenuation Rate of ELF Radio Waves," J. Res. Nat. Bur. Stand., vol. 65D, no. 5, p. 475; September-October 1961. ABSTRACT: Propagation attenuation rates for frequencies below 1 kc/s in the ELF region (30 c/s to 3,000 c/s) were calculated from the spectra of atmospherics observed at widely-spaced stations. Data are presented for east to west propagation under sunset approaching the eastern station. Under these conditions, the attenuation rates are about 1 db/1,000 km at 75 c/s and increase with increasing frequency, attaining about 3 db/1,000 km at 200 c/s. The attenuation rates observed seem to be consistent with a two-layered ionosphere model with its lower region 90 km above the earth. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4610. JOHLER, J. R., "On the Analysis of LF Ionospheric Radio Propagation Phenomena," J. Res. Nat. Bur. Stand., vol. 65D, no. 5, p. 507; September-October 1961. ABSTRACT: Recent theoretical work which employs the classical magneto-ionic theory of propagation model of the ionosphere applicable to transmission via the ionosphere at or close to grazing incidence is employed to analyze LF propagation data. The results of the analysis illustrate a practical model of the ionosphere by a detailed study of transmission via the first time-mode in particular. Recent contribution and extensions to the classical geometric-optical theory of propagation (Wait and Conda, 1958; Wait, 1960a; Johler and Walters, 1960, 1961) of LF waves about the earth provide a valuable analysis tool for the interpretation of various experimental data. This paper summarizes the mathematical formulas required to predict the field with particular emphasis on a type analysis most suitable for large scale electronic computers. Attention is focused on certain available experimental data and the results of the analysis are detailed with emphasis on technique. However, the physical phenomena which can be deduced as a result of the analysis of these data are given considerable attention to emphasize the value of the technique. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4611. KALAFUS, R. M., AND LYON, A. M., "Feasibility of Electrically Small Antennas on an Energy Basis," Eleventh Annual Symposium on USAF Antenna Research and Development, University of Illinois; October 1961. ABSTRACT: This paper presents a basic analysis and conclusions of a study intended to determine whether it is possible to enhance the performance of small antennas by utilizing materials such as dielectrics and ferrites. The shorter wavelength in materials having high permeability and permittivity is attractive, for it suggests the possibility of reducing the physical size of an antenna. Other possibilities for improvement include beam-shaping, efficiency, and broadbanding in certain devices. Work has been carried out investigating material-filled cavities, slots, and waveguide horns as well as imbedded loops and dipoles. The theoretical results have been encouraging but experimental verification depends highly on the availability of low-loss materials, which exist now only in small quantities. (a-1, b-3, c-1, d-1, e-0, f-Theory)

4612. POEVERLEIN, H., "Resonance of the Space between Earth and Ionosphere," J. Res. Nat. Bur. Stand., vol. 65D, no. 5, p. 465; September-October 1961. ABSTRACT: When noise radiation of roughly one or a few kilocycles per second is emitted in the higher atmosphere, part of it (an extraordinary wave) is propagated downward into the space between earth and ionosphere. Reflection at the earth and ionosphere leads then to a standing wave in this space, whose intensity for a given incident power flux varies very much with frequency. Maximum field strength of the standing wave is derived for the resonance frequencies of the space. The incident wave fronts are assumed to be horizontal. Only clearly defined wave fronts being of a sufficiently wide extension and showing no noticeable irregularities will lead to a definite resonance. The space between earth and ionosphere is comparable to an air gap between two parallel plane reflectors. The lower ionosphere is however only a partial reflector, allowing radiation to enter the resonance space and causing at the same time some loss of energy out of the resonance space (leakage). Stratification of the lower ionosphere has some

influence on the resonance phenomena. With a D layer, an additional resonance at a lower frequency is obtained. It seems too early to decide whether in any observed noises the resonance spectrum of the space between earth and ionosphere becomes apparent, but it is expected that noise spectra observed on the ground are modified by the resonances. In case of monochromatic emissions, the received intensity depends on the position in the resonance spectrum. The resonance spectrum should be received in case of emission of a white-noise spectrum, provided the wave fronts are appropriate. In a space between two infinite parallel plates resonance is observed when half a wavelength or multiples of a half-wavelength fit into the space. The electromagnetic field in this case of resonance is that of a standing wave whose wave planes are parallel to the plates. If one of the plates is made partially transparent, a model of the earth and ionosphere is obtained. The semitransparent plate like the ionosphere lets waves enter from outside - or from the higher atmosphere - and still permits resonance oscillations. The phenomena encountered in the case of two semitransparent plates (wire gratings) or one conductor together with a semitransparent plate (grating or dielectric plate) have been described in the literature (Casey and Lewis, 1952; Wait, 1954, von Trentini, 1956). The field intensity in the resonance space is strongly dependent on the frequency of the incident waves, showing peaks at the resonance frequencies. The partial transparency of one of the reflectors entails imperfect reflection and contributes thus to a limitation of the resonance peaks. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4613. PRASAD, S., AND KING, R. W. P., "Experimental Study of Inverted L-, T-, and Related Transmission-Line Antennas," J. Res. Nat. Bur. Stand., vol. 65D, no. 5, p. 449; September-October 1961. ABSTRACT: An experimental study is made of inverted L-, T-, and related transmission-line antennas and of antennas with two-, three-, and four-element top loads. The apparent measured impedance is corrected for end effects; the approximate theoretical impedances are calculated for very small heights for which measured values cannot be obtained readily. The transmission-line antennas studied are shunt-driven with one open and one closed end or with two closed ends. (a-1, b-1, c-1, d-1, e-0, f-Investigation)

4614. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Progress Report No. 5, Contract No. DA 36-039-sc-84966, ASTIA No. AD-272 805, October 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4582)

4615. WAIT, J. R., "On the Impedance of Long Wire Suspended over the Ground," Proc. IRE, vol. 49, p. 1576; October 1961. ABSTRACT: Much has been written over the years on the subject of the ground or suspended above it. The possibility that a long horizontal wire will be feasible radiator of VLF radio waves has reopened interest in the problem. It is the purpose of this note to outline a rather simple solution for the impedance of an infinitely long wire located at a height h over a homogeneous flat ground. (a-1, b-1, c-1, d-1, e-632, f-Short letter)

4616. WAIT, J. R., "A Note Concerning the Excitation of ELF Electromagnetic Waves," J. Res. Nat. Bur. Stand., vol. 65D, no. 5, p. 481; September-October 1961. ABSTRACT: Previous solutions for the ELF mode series are discussed briefly. Particular attention is paid to the height-gain functions. The excitation of the modes for vertical and horizontal dipole excitation is also considered. (a-1, b-1, c-1, d-1, e-0, f-Discussion)

4617. YABROFF, I., "Computation of Whistler Ray Paths," J. Res. Nat. Bur. Stand., vol. 65D, no. 5, p. 485; September-October 1961. ABSTRACT: Calculations of whistler ray paths in the outer ionosphere are shown for a variety of electron density profile models including exponential, constant, and columnar profiles. The Haselgrove formulation of the ray equations was used with the magneto-ionic representation of the wave refractive index to develop a set of differential equations for ray tracing suitable for inhomogeneous, anisotropic medium. The variation of paths with frequency, latitude, initial wave-normal angle, and other variables are examined for the purpose of providing a preliminary basis for comparison of the theoretical with some of the experimental results. (a-1, b-1, c-1, d-1, e-0, f-Experimentation and analysis)

4618. WILLIAMS, C., "AN/TRD-15 Automatic Readout," Servo Corporation of America, Long Island, New York, Quarterly Progress Report No. 1, Contract No. DA 36-039-sc-87279, Report No. SCA-27900-RQ-1, ASTIA No. AD-265 359; 16 October 1961. ABSTRACT: Research is concerned with an investigation to determine whether it is possible to provide an automatic feature to the direction finder which will eliminate the human operator or reduce the skill required of the operator. Progress is described toward instrumenting the AN/TRD-15 HF doppler direction finder for a study to determine the existence and degree of correlation between azimuth angle of arrival, vertical angle of arrival, signal strength, and harmonic content of the data signal, the purpose being to derive logic for an automatic readout system. An indicator which is capable of presenting both azimuth and vertical angles of arrival is described. (a-1, b-3, c-1, d-1, e-367, f-Investigation report)

4619. REHAHN, J. P., "Technology of Radio Direction-Finding Devices," Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio, Translation No. MCL-1328, Original article: Nachrichtentechnik, vol. 9, pp. 382-391, 1960, ASTIA No. AD-265 725; 19 October 1961. ABSTRACT: A synopsis is given of frequently used radio direction-finders. General viewpoints are found for a systematic presentation and directional modulation is given as the essential feature. In describing actually constructed devices, only the most important properties are considered. (a-1, b-2, c-1, d-4, e-0, f-Translation)

4620. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory, Quarterly Progress Report No. 1, Contract No. DA 36-039-sc-87264, Continuation of DA 36-039-sc-84525, ASTIA No. AD-271 531; 31 October 1961. ABSTRACT: Studies and investigations were made which will lead to the design of a radio direction finding system for the MF-HF-VHF range. The traveling-wave antenna RDF system was operated in the field, and performance data are included. The source of instability in the counter circuits for the pulse waveform modulators was found. Work was continued on a special purpose analog calibrator for the SADIST system. Additional improvements were also made in the panoramic RDF system. Problems in the development of a VHF/UHF antenna are discussed. (a-1, b-3, c-1, d-1, e-460, f-Progress report. See Abstract No. 4585)

4621. MONSER, G., AND CECIL, J., "Design and Development of Antenna Group for Direction Finder Sets AN/PRD-7( ) and AN/PRD-8( )," American Electronic Laboratories, Inc., Colmar, Pennsylvania, Quarterly Progress Report No. 2, Report No. 60042-2, ASTIA No. AD-271 154; 31 October 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4598)

4622. SHERRILL, W. M., AND TRAVERS, D. N., "Single-Channel Direction Finding in a Multicomponent Field," IRE Trans., vol. AP-9, no. 6, pp. 521-526, November 1961. ABSTRACT: Theoretical and experimental results are presented which show that a spinning simple-loop, single-channel direction finding system is capable, in principle, of resolving the directional components of a multi-component field. Calculated and measured bearing displays for the case of two and three components are compared. Directional resolution of components of equal and differing frequencies is demonstrated and methods of presenting the bearing display are discussed. (a-2, b-1, c-1, d-1, e-1000, f-Experimental results)

4623. SHERRILL, W. M., MOORE, J. D., AND TRAVERS, D. N., "Electrostatic Shielding of the Spaced Loop Antenna for Signals of Mixed Polarization," Southwest Research Institute, Report No. 5, Contract NObsr 85086; 1 November 1961. ABSTRACT: Results are reported of an investigation of the effects of electrostatic shield configuration on the response of the spaced loop antenna to signals of mixed polarization. It is found that strong electrical coupling of the shield to the antenna can result in degraded spaced loop response to incident waves with horizontally polarized components. Because of the weak antenna to shield coupling of ferrite spaced loops, these antennas show proper response to signals of mixed polarization. Progress regarding the evaluation of the Servo Corporation DFG-4 Doppler direction finder and the evaluation of the Racal RA. 17 and the R-390A receivers is summarized. (a-1, b-3, c-1, d-1, e-1000, f-Study report)

4624. ANONYMOUS, "Radio Location Techniques," Ohio State University, Research Foundation, Columbus, Ohio, Progress Report No. 3, Contract No. AF 30(602)2214, ASTIA No. AD-326 759; 4 November 1961. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4596)

4625. COOPER, R. E., AND TRAVERS, D. N., "Fourth Interim Report: The Beverage Direction Finder. Interim Development Report for a Study Technique to Produce a High Frequency Land-Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, Contract NObsr 85364; 4 November 1961. ABSTRACT: A skywave bearing test of the 360° Beverage array has been completed. Standard deviations between 3.5 and 4.3 degrees were obtained on identified signals between 5 and 25 mc for a semple of several hundred bearings. These results were obtained under a number of unfavorable equipment conditions including a very slow scan rate and wide spacing between antennas. In the future, it is believed that the standard deviation can be made to approach 2 degrees. Equations for calculation of three-dimensional patterns for the Beverage antenna have been derived. Calculations of two elevation patterns were made. The 72 degree sector array with 2 degree spacing has been completed including preliminary checks. Measured pattern data obtained agrees with theoretical calculations for ground wave propagation. Antenna parameters (transmission line constants and effective height) have been determined on single antennas in each array over the frequency range of 5 to 25 mc. Work on the inductive commutator has been postponed in favor of a semiconductor diode switch. Development of this diode commutator is about 60 per cent complete. A comprehensive technical report which presents in detail all accomplishments of this program to date is now about 50 per cent complete. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4584)

4626. BLACKBAND, W. T., "Effects of the Ionosphere on VLF Navigational Aids," J. Res. Nat. Bur. Stand., vol. 65D, no. 6, p. 575; November-December 1961. ABSTRACT: Long range navigational aids could be devised using VLF transmissions. The propagation of such waves is controlled by the lowest level of the ionosphere. The small changes in phase velocity which accompany the diurnal ionospheric changes have been studied using ground monitor stations. Preliminary measurements made in an aircraft show internal consistency in fixing of about 1 nautical mile at ranges of 5,000 to 6,000 miles. (a-1, b-1, c-1, d-1, e-0, f-Discussion)

4627. BOYLE, H. M., "Airborne Homing System," Wireless World, vol. 67, no. 12, pp. 614-615; December 1961. ABSTRACT: Phase difference measured to provide direction finding information; this is accomplished by phase-shifting network between 2 antennas used for reception of transmission on which it is required to home; certain improvements in method are discussed. (a-3, b-2, c-1, d-5, e-0, f-Description)

4628. BREESE, M., COLBERT, M., RUBIN, W., AND SFERRAZZA, P., "Phase-Locked Loops for Electronically Scanned Antenna Arrays," Trans. IRE, vol. SET-7, no. 4, pp. 95-100; December 1961. ABSTRACT: ATHESA (Automatic Three-dimensional Electronic Scanned Array) technique for achieving very high antenna gain for deep-space communication systems is described; phase coherence over band of frequencies is established on reception automatically and continuously for either stationary or moving targets by phase locking signals from antenna elements separated by many wavelengths to reference antenna element. (a-3, b-1, c-1, d-1, e-0, f-Description)

4629. HERMAN, J. R., "Reliability of Atmospheric Radio Noise Predictions," J. Res. Nat. Bur. Stand., vol. 65D, no. 6, p. 565; November-December 1961. ABSTRACT: Measured radio noise values are compared with the corresponding International Radio Consultative Committee (C.C.I.R., 1957) predicted values at four noise measuring stations. Five frequencies between 0.013 and 10.0 Mc/s are considered. The stations selected for this study include Balboa, Panama, near two major radio noise centers, and Byrd Station, Antarctic, remote from atmospheric radio noise sources. It is found that the predicted and measured noise levels are in good agreement except at some places and times, where large discrepancies occur. Most of the disagreements are found at places where the predictions are based on extrapolations of data measured at other stations. Reasons for the disagreements are discussed. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4630. MOORE, R. K., AND BLAIR, W. E., "Dipole Radiation in a Conducting Half Space," J. Res. Nat. Bur. Stand., vol. 65D, no. 6, p. 547; November-December 1961. ABSTRACT: The problem of communication between antennas, submerged in a conducting medium such as sea water, is analyzed in terms of a dipole radiating in a conducting half space separated by a plane boundary from a dielectric half space. The theory is discussed for both horizontal and vertical, electric and magnetic dipoles. Expressions for the Hertzian potentials of the dipole in the conducting half space can be reduced to integrals obtained by Sommerfeld (for a dipole at the boundary) multiplied by an exponential depth attenuation factor. The Hertzian potentials are used to determine the electric and magnetic field components. This analysis shows that the main path of communication between submerged antennas is composed of three parts as follows: (a) energy flow from the transmitting dipole directly to the surface of the sea, (b) creation of a wave that travels along the surface refracting back into the sea, (c) energy flow normal to the surface to the receiving dipole. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4631. RAEMER, H. R., "On the Spectrum of Terrestrial Radio Noise at Extremely Low Frequencies," J. Res. Nat. Bur. Stand., vol. 65D, no. 6, p. 581; November-December 1961. ABSTRACT: A theory of the frequency spectrum of radio noise at extremely low frequency (ELF) is presented and the results compared with recent measurements of the first five "Schumann" resonant modes (between 8 and 34 c/s) made by Balser and Wagner (1960). The source of this noise is assumed to be return strokes in vertical cloud-ground lightning flashes distributed randomly in time, uniformly in angular displacement along the earth relative to the observer and with statistics of stroke duration, interstroke intervals and strokes per flash taken from studies of thunderstorms reported by J.C. Williams. Thus, the mathematical model for the noise sources is an extremely simple one, being analogous to the shot effect in electron devices. The electromagnetic model employs the familiar waveguide mode theory, assumes a sharply bounded homogeneous ionosphere, and neglects the earth's magnetic field. Agreement between the shape of the theoretical and observed spectrum is good for the first three modes and rather poor for the higher modes. It is found by matching the theoretical resonant frequencies to the observed resonances that the product of effective ionosphere height h and the square root of effective conductivity $\sqrt{\sigma_i}$ is a decreasing function of frequency. The functional dependence of this quantity on frequency is determined and used in the calculation of the mode spectrum. Discrepancies between the theory and experimental results are believed to be partially due to the artificiality of the sharply bounded homogeneous ionosphere model and to failure to give sufficient probability weighting to equatorial regions of abnormally high thunderstorm activity. These last items are the subjects of continuing work on the extension of the theory. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4632. WILSON, A. C., "Measurements of Low-Angle Radiation from a Monopole," J. Res. Nat. Bur. Stand., vol. 65D, no. 6, p. 641; November-December 1961. ABSTRACT: Experimental measurements using scale model techniques have been carried out to determine the effectiveness of a ground system of long-wire radials to obtain low angles of departure of transmission. Since transmission was to be in one direction only, the ground wires were laid out to form a ground-plane sector approximately 18° wide centered in the direction of transmission. The antenna was a base-driven vertical monopole. Measurements were made of the relative response in decibels for the monopole used as a receiving antenna at a frequency of 400 megacycles per second. The target transmitter antenna was always located at a distance of 200 wavelengths. At this separation the ground plane sector was in the near field of the target transmitting antenna and appropriate corrections must be made. The received signal strength improvement due to the presence of the ground sector was approximately 14 decibels. The measured lobe positions of the first and second beam maximums and the first null are in good agreement with theory. (a-1, b-1, c-1, d-1, e-0, f-Measurements)

4633. WU, T. T., "Transient Response of a Dipole Antenna," J. math. Phys., vol. 2, no. 6, pp. 829-894; November-December 1961. ABSTRACT: The current distributed for a dipole antenna driven by a step-function voltage is found shortly after the switch-on of the voltage. (a-1, b-1, c-1, d-1, e-0, f-Theoretical and experimental analysis)

4634. WILLIAMS, C., "AN/TRD-15 Automatic Readout," Servo Corporation of America, Hicksville, New York, Quarterly Progress Report No. 2, Contract No. DA 36-039-sc-87279, ASTIA No. AD-270 943; 5 December 1961. ABSTRACT: Investigations were continued on the AN/TRD-15 doppler direction finder automatic readout. A study was made of bearing shift with receiver antenna trimmer rotation. A preliminary report of investigation of the recorded parameters and details of the automatic readout are also presented. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4618)

4635. COOPER, R. E., AND TRAVERS, D. N., "Evaluation of the DFG-4 UHF Direction Finder with Concentric through Mast Installation," Southwest Research Institute, Task Summary Report Number X, Contract NObsr 85086; 15 December 1961. ABSTRACT: A shipboard comparison and evaluation of the AN/URD-4 Adcock and the Servo Corporation DFG-4 Doppler UHF Direction Finding equipments were

made on board the USS O'Hare, DDR-889, during March 1961, at Norfolk, Virginia. Results of these tests were presented in Task Summary Report IX, dated 15 April 1961. The DFG-4 equipment was then sent to Southwest Research Institute for a land based evaluation of performance with the dipole elements installed concentrically and not at the top of a vertical mast. Pending results of initial tests, reradiation effects and investigation of concentric mounting on a mast of 15 inches in diameter were to be considered. Equipment installation at Southwest Research Institute was completed during July 1961, and was described in Interim Development Report dated 1 April 1961. This installation description is repeated in this report for completeness. Tests on a 225-400 mcs. Doppler with a concentric thru-mast installation were conducted. (a-1, b-3, c-1, d-1, e-1000, f-Progress

4636. ANONYMOUS, "Development of Systems for Locating and Analysing Radars and Jammers," Laboratoire Central de Telecommunications (France), Final Report, Contract No. F-65-MWP-A-59, ASTIA No. AD-331 704; 1962. ABSTRACT: Not available. (a-4, b-3, c-8, d-3, e-0, f-0)

4637. ANONYMOUS, "Wildlife Research - Problems, Programs, Progress, 1962," U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Circular 166, Page 29; 1962. ABSTRACT: Describes a Montana study in which a radio tracking system was completed and tested in 1962 with an instrumented bear. The bear was then located by triangulation using portable direction finders. (a-4, b-3, c-1, d-1, e-830, f-Government circular review wildlife research)

4638. BURTNYK, N., MCLEISH, C. W., AND WOLFE, J., "Ionosphere Layer Tilts at Ottawa, Canada," Canad. J. Phys., vol. 40, p. 1614; 1962. ABSTRACT: A comparison of E- and F-layer tilts is made with previously published results. Both E-layer and night F-layer tilt variances are significantly higher even when known storm periods are eliminated. Some observations on unstable F modes are also reported. (a-1, b-1, c-1, d-7, e-0, f-Propagation study report)

4639. COTTONY, H. V., "Current Development in an Electronically Scanned Antenna," Electromagnetic Theory and Antennas Symposium, Copenhagen, Denmark, pp. 1289-1294; 1962. ABSTRACT: Extensions of the National Bureau of Standards' scanned linear array, described herein. The new vhf array has 25 Yagi aerials spaced 10 m apart, scanned at 20 scans per sec. The half-power beamwidth of the main lobe is approx. 1-1/2°. Typical oscillograms show the variation of signal strength with time and with direction of arrival of a signal, in the 40 Mc/s region, from a 1295 km distant source. Similar hf arrays (12-25 Mc/s) are described, scanning at 500 scans per sec: one scans in azimuth, its companion, to be supported by a 152 m tower, scans in elevation. The mathematics of this latter are given, with a computed radiation pattern. (a-3, b-1, c-8, d-20, e-0, f-Description)

4640. FARAGO, L., The Tenth Fleet, Ivan Obolensky, Inc., New York; 1962. Pages with special reference to HF/D/F operations: 6, 11, 138, 139, 162, 184, 187, 193, 195, 196, 199, 200, 208, 218, 220-228, 232-233, 256, 267, 269, 274-277. ABSTRACT: This history of U.S. action against German U-boats in World War II is told in terms of the special submarine countermeasures group within the Navy Department known as "The Tenth Fleet." The Tenth Fleet comprised an entirely shore based unit which developed and integrated U.S. antisubmarine warfare (ASW) tactics throughout the battle of the Atlantic. It consisted of the convoy and routing division (which included and technicians and an elite corps of 50 officers and enlisted men who contributed the fundamental operations, intelligence and technical leadership of the group (p. 174). The Tenth Fleet served to integrate the use of sonar, radar, HF direction finding and espionage reports for the detection and tracking of U-boats with the search and destroy activities of ships and tracking of U-boats with the search and destroy activities of ships and planes. Shore based direction finding stations were set up by the Tenth Fleet which were tied in with the British to produce four D/F nets in Iceland, Africa, Brazil and England. These stations provided long range detection and location (by triangulation from all stations in the nets) of German U-boat activity. The coordinating center of D/F information was in Maryland where the converging bearings from all stations making an intercept were correlated resulting in the calculation of geographical coordinates of the submarine. Signal signature analysis techniques were developed in conjunction with D/F activity which permitted identification of different U-boats within small areas and recognition of the type data communicated including weather, tactical information, or routine nonmilitary communications (pp. 220-228). Since the British were acknowledged leaders in HF/D/F technology, the Tenth Fleet made maximum use of British cooperation including the installation of British type shipboard HF direction finders on U.S. ships. Of particular value was the utilization of shipboard D/F in conjunction with small ASW aircraft carriers and associated destroyer escorts in ASW engagements. With the development of high performance nuclear submarines armed with ballistic missiles, the need for modern ASW capability has become acute. Present Naval ASW research and development programs are exploring many promising areas of submarine countermeasures, but these are generally extensions of World War II techniques which may be insufficient to counter the capabilities of modern submarines. (a-4, b-6, c-1, d-1, e-0, f-Survey)

4641. GETHING, P. J. D., "Lateral Deviation and Effective Path Length for Oblique Propagation through the Atmosphere," Ionosphere Conference, London; 1962. ABSTRACT: Millington's expressions for lateral deviation and effective oblique path length on an ionospheric path, derived from his quadratic equation defining propagation in the presence of a magnetic field, are summarized in standard notation. They are then used to calculate bearing errors and departures from Breit and Tuve's theorem (1926) arising on a path previously treated by Booker. The ionospheric layer is assumed to be of parabolic form and values are calculated for two cases in which the signal frequency is twice and four times the gyrofrequency respectively. It is found that the bearing errors approach a theoretical maximum on this path of 6.8° for the ordinary and 4.1° for the extraordinary ray as the signal frequency approaches the muf. Breit and Tuve's theorem is closely satisfied by the ordinary ray but not by the extraordinary; the error resulting from the use of this theorem is related to the behaviour of the quantity ($\mu\mu'$ - 1) over the path. (a-3, b-3, c-1, d-5, e-0, f-Propagation theory)

1962

4642. HEADFORD, P. W., "Forty-Eight Channel Pulse Selector for Australian D.M.E. System," AWA Tech. Rev., vol. 12, no. 1, pp. 49-62; 1962. ABSTRACT: Extended and more precise signal decoding facilities in ground beacons are obtained by use of transistorized pulse selector; selector decodes 48 pulse duration/pulse separation codes, and generates response to selected code; techniques which provide precise timing. (a-2, b-1, c-1, d-11, e-0, f-Description)

4643. HOLMES, F. W., AND JOHNSON, R. H., "Microwave Phase-Comparison System and Its Application to Direction-Finding," Proc. IEE, vol. 109, Part B (Suppl.), no. 23, pp. 670-700; 1962. ABSTRACT: Accurate and stable method of measuring RF phase difference between 2 microwave signals; measurement is made by adjusting reference phase shifter applied to one of 2 signals entering waveguide hybrid so that 2 output signals are made equal in amplitude; switching arrangement makes system insensitive to errors caused by variations in performance of detectors and amplifiers, even when signal amplitudes are unequal; equipment operating in X-band. Paper 3726E. (a-2, b-1, c-1, d-5, e-0, f-Description)

4644. KUKES, I. S., AND STARIK, M. YE., "Principles of Radio Direction Finding," Moscow: "Soviet Radio" Publishing House; 1962. ABSTRACT: This book, written in Russian, appears to be a detailed reference pertaining to elementary aspects of direction finding. Chapters 9, 10, and 11 have been translated into English by the Foreign Technology Division of Air Force Systems Command, and this has been documented and filed (see: ASTIA No. AD-620 966; also: FTD MT-65-58). A copy of the translation is available. The table of contents for the entire book follows: (1) The Problem of Radio Direction Finding (RDF). (2) The Principles and Methods of RDF; The Electromagnetic Field and Its Polarization; The Principles of RDF; RDF Methods; Phase Methods of RDF; Radio Direction Finder Errors; The S/N Ratio at the Receiver Output; Noise Strength at the Receiver Input; The S/N Ratio at the Output of the Linear Section of the Receiver; The S/N Ratio at the Detector Output; Selection of Transmission Band; Sensitivity during Audio Bearing Reading from the Minimum; Sensitivity of the Radio Direction Finder Using the Comparison Method; Sensitivity of Direction Finding by Minimum Percentage-Modulation; Sensitivity of Direction Finding by the Phase Method; Sensitivity of a Two-Channel RDF; Noise-proofing of RDF. (3) RDF Antenna Systems; Vertical Antenna; Folded-Dipole Antenna; Frame Antenna; The EMF in a Small Frame; The EMF in a Frame Consisting of Several Loops; The Influence of Nonuniform Current Distribution; Shielded Frames; Frames with Ferromagnetic Cores; Reception with Two Spaced Antennas; A System of Two Spaced Frames; Combined Reception on an Open Antenna and a Directional System; Fixed Directional Antennas with a Cosinusoidal Directivity Characteristic; A Goniometric System of n Spaced Antennas; An Equivalent Circuit for Calculation; A System with Parallel Coupling of Adjacent Antennas; Antenna Systems with Sharp Directivity Characteristic; The Use of n Antennas in a Row; Circular Antenna Systems with

Sharp Directivity Characteristic; Antennas with Logarithmic Structure; RDF Antenna Systems for SHF; Parallel Operation of RDF Receivers from a Common Antenna System. (4) Instrument Errors; RDF Instrument Errors, The Antenna Effect in a Rotatable Loop, Eliminating the Antenna Effect in a Rotatable Loop; Instrument Errors of a System with a Rotatable Loop; The Antenna Effect in a Goniometric System; Errors in the Goniometric System; Goniometer-Caused Errors, Instrument Errors of a Spaced-Antenna System; Error in the Spacing of a Goniometric System of n Spaced Antennas; Adjustment Errors of a Goniometric Spaced-Antenna System Error in Antenna Orientation; Inequality of the Level of the Basic Antenna; Inequality of the Radius of Antenna Positioning; Tilt of One of the Antennas; Balancing of the Circuit When Connecting the Antennas with Coaxial Cable, The Effect of Inequality of the Electrical Lengths of Cables in the Goniometric System; The Effect of Inequality of the Electrical Lengths of Cables in a Circular Antenna System with Sharp Directivity Characteristic; The Effect of Inequality of the Electrical Lengths of Cables in an RDF with Cyclic HF Phase Measurement. (5) The Influence of Locale and Environment, The Nature of the Influence of Locale and Environment; The Shore Effect; The Influence of Nonuniformity of the Ground; The Influence of Unevenness of the Ground; The Influence of Nearby Objects on the RDF; Types of Back-Radiators; The Effect of an Antenna Located Near an RDF; Antenna Located in the Immediate Vicinity of the RDF, Antenna Located Far from the RDF; The Effect of a Back-Radiating Frame; Deviation Caused by the Hull of a Ship, Deviation of a Ship and Airplane RDF. (6) RDF Errors Associated with Radiowave Propagation; The Influence of Abnormal Polarization of the Electrical Field; Determination of Error Due to Abnormal Polarization of the Electrical Field; RDF Systems Free of Polarization Errors; A Spaced-Frame System; A Spaced-Antenna System. Various Connecting Circuits; Systems with Pulsed Transmission, Lateral Deviations of Radiowaves of the SW Range; Interference of Radiowaves of the SW Range; Cosinusoidal System; An RDF with Cyclic HF Phase Measurement; Features of Direction Finding on Various Wavebands and Selection of an RDF Antenna System; D/F on Superlong and Long Waves (Frequency Less than 100 kc); D/F on Middle Waves (Frequency 100-1500 kc); D/F on Short Waves (Frequency 1.5-30 Mc); D/F on Ultrashort Waves (Frequency 30-300 Mc). (7) Calculation on RDF Antenna Systems; Preliminary Concepts, Input Circuit Noise Factor; Calculation of the Efficiency of a Tuned Frame; Calculation of the Efficiency of a Frame with Inductive Coupling; An Untuned Frame with Inductive Coupling; A Goniometric System with Closed Frames; Calculation of the Virtual Height and Input Resistance of an Antenna System with Close Spacing of Vertical Antennas (Cosinusoidal Directivity Characteristic); The Influence of the Number of Antennas, Calculation of the Virtual Height and Input Resistance of an Antenna-Feeder System Consisting of a Pair of Antennas, with Direct Coupling of the Antennas to the Feeders; Calculation of an H-System; Reception of a Vertically Polarized Field; Reception of a Horizontally Polarized Field, Efficiency Calculation, Calculation of a U-System, Calculation of Transformer and Balanced Systems; Calculation of a Transformer System, A Balanced H-System with Feeders Directly on the Ground; A Balanced H-System with Feeders Raised Above the Ground; Matching Devices, Calculation of the Input Circuit of a Matched Antenna System; Compensation for Antenna Effects, Calculation of the Elements to Compensate for Antenna Effects, Calculation of Unidirectional Reception; System with Untuned Vertical Antenna and Tuned Frame; System with Untuned Vertical Antenna and Untuned Frame; Use of the Antenna Effect of the Frame, and Simplified Systems of Unidirectional Reception. Use of the Grounded Point of Goniometer Field Coils in a System with Spaced Antennas. (8) Visual RDF; Semiradio Compasses, Automatic RDF with Servo Drive (Radio Compasses); A Two-Channel Automatic RDF with Visual Bearing Reading, Visual Selectivity; Requirements of the Reception Channels; Balancing of the Modules of the Gain-Factor Channels; Adjustment of the Gain When Using a Pulsed Control Signal; Balancing of the Voltage Phase Shifts in the Channels, Obtaining a Unidirectional Bearing; Single-Channel RDF; Direction Finders with Two-Tone Modulation (Method of Comparison of Percentage Modulation of the Received Signal); Direction Finders with Alternate Switching-in of Antennas and the Indicator (Display Unit); Two-Channel Display Receiver with Partial Grouping of Channels; RDF Instrument Errors Due to Phase Shifts in the Receiver; Phase-Meter RDF; Direction Finders with Mechanical Rotation of the Radiation Pattern; Direction Finders with Electrical Rotation of the Radiation Pattern, Selection of the Rotation Frequency (Modulation) in Phase-Meter Direction Finders; RDF with Large-Base Antenna System; Amplitude Method of Direction Finding; Phase Method of Direction Finding, Pulsed RDF; RDF with Cyclic HF Phase Measurement; Automation of Reading and Averaging of the Bearing. (9) Tests of Radio Direction Finders (This Part Translated); Laboratory Tests of Direction Finders with a Rotating Loop; Laboratory Tests of Direction Finders of a Goniometric System. Tests of Loops; Testing of the Goniometer, Test of a Radio Direction Finder as a Whole; Laboratory Tests of Radio Direction Finders with Wide Antenna Spacing; Tests of Direction Finders in Real Conditions of Work; Determining Instrument Error of a Radio Direction Finder; Determining the Magnitude and Nature of Local Errors; Determining General Accuracy of a Radio Direction Finder; Determining General Sensitivity of a Radio Direction Finder; Determining the Directivity Pattern and the Directivity Factor. (10) Different Applications of Radio Direction Finders (This Part Translated); Ship Radio Direction Finder. Selection of Site; Mounting of the Antenna Array of a Radio Direction Finder, Taking the Curve of Deviation of a Ship Radio Direction Finder; Radio Direction Finder on an Aircraft; Compensation of Deviation in a Radio Direction Finder with a Rotatable Loop, Mechanical Methods of Compensating Deviation; Electrical Compensation of Deviation by Installing a Loop; Electrical Compensation of Deviation in a Goniometric Radio Direction Finder; Compensation of Quadrant Deviation D sin 2q; Compensation of Quadrant Deviation E cos 2q; Land (Airport, Shore) Radio Direction Finder. (11) Accuracy of Position Finding by Radio Bearings (This Part Translated); Methods of Estimating a Single Bearing; Ellipse of Error with n Radio Direction Finders; Region, Serviced by Two Radio Direction Finders. (12) Plotting Radio Bearings on a Chart, Orientation of the RDF; A Short Description of Charts; Plotting Radio Bearings on a Chart; Automation in Site Determination; Azimuth Calculation (Appendix): Calculation of Frame Parameters; Derivation of Formulas for Magnetic Fields in a Multiwinding Goniometer; General Expressions for Parameters of an Elliptical Field; Determination of the Direction of the True Meridian; and Bibliography. (a-4, b-3, c-1 and 2, d-2, e-856, f-Principles of RDF)

4645. MORISON, S. E., Supplement and General Index, History of United States Naval Operations in World War II, Volume XV, Little, Brown and Company, Boston, 1962. ABSTRACT: A general index to the 15-volume set of the History of United States Naval Operations in World War II. The general index includes numerous entries on high frequency direction finders specifically in volumes I, VIII and X. These references have been abstracted elsewhere. (a-4, b-6, e-1, d-1, e-0, f-Supplement and general index to above cited historical accounts)

4646. MARSHALL, W. H., GULLION, G. W., AND SCHWAB, R. G., "Early Summer Activities of Porcupines as Determined by Radio-Positioning Techniques," J. Wildl. Mgmt., vol. 26, no. 1, p. 75; January 1962. ABSTRACT: Field testing a radio-positioning technique for determining animal movements during the late spring and early summer of 1960 presented an opportunity to study certain aspects of the activities of porcupines (Erethizon dorsatum). Repeated and frequent location of 3 individuals provided data on movements and habitat selection as well as on preference of tree species and/or ground level shelters as daytime resting places. In addition, observations were made on the influence of mosquitoes on activity and on foods taken. This study was conducted at the Forest Research Center of the University of Minnesota near Cloquet, Minnesota from May 26 to July 16, 1960. The 3,300-acre area lies in a glacial outwash plain that is much interrupted by eskers and basins, the latter now in the bog-forest stage of succession. Upland tree cover consists of a variety of conifer-hardwood forests (Allison and Brown, 1946; Burcalow and Marshall, 1958). In both the upland and bog forests there is a heavy undergrowth of brush, herbaceous plants, and ferns (Magnus, 1949). Details on the use of the miniature 50-g radio transmitters having a signal range of approximately 1.5 miles are described in a preliminary report (Marshall, 1960). A unit was fastened on the back of each of 2 adult female porcupines by means of a modified dog harness and on the back of an immature female, the young of one of the adults, by means of a homemade buckskin harness. The location of the animals was determined at dawn, midday, and dusk by means of a 14-lb portable radio signal-locator equipped with directional antenna. Most records reported here were sight observations made by homing on the radio signals directly to the animal. (a-1, b-3, c-1, d-1, e-0, f-Biotelemetry)

4647. PRASAD, S., "Radiation Field of the Corner-Driven Square Loop Antenna," Proc. Nat. Inst. Sci. India, vol. 28A, no. 1; January 1962. ABSTRACT: The radiation properties of the square loop driven in the zeroth phase sequence (voltages in phase at all four corners), the second phase sequence (alternately in and out of phase at the corners) and a simple superposition of the two phase sequences are studied. Assuming zeroth-order current distributions, the theoretical far-zone field has been obtained for each phase sequence and for the superposition. The square loop was used as a receiving antenna in obtaining the experimental radiation patterns for the same cases. In general, there is good agreement between theory and experiment. In some cases the contributions due to the transmission lines driving the loop is such that the experimental pattern does not agree with theory. However, when the effect of the transmission lines is taken into account, the corrected theoretical pattern agrees well with experiment. (a-1, b-1, c-1, d-8, e-0, f-Study)

4648. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute Report No. 6, Contract No. DA 36-039-sc-84966, ASTIA No. AD-275 081L; January 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4614)

4649. TSVETNOV, V. V., "Threshold Sensitivity of Ideal Phase Measuring Loops," Radiotekhnika, vol. 17, no. 1, pp. 68-75; January 1962. See also English translation in Telecommunications and Radio Eng., Part 2, no. 1, pp. 68-76; January 1962. ABSTRACT: Statistical properties of phase fluctuations under effect of Gaussian noise are analyzed in inertialness and inertial ideal phase measuring loops such as used in radio navigation, analytical solution of their threshold sensitivity. (a-3, b-2, c-2, d-2, e-0, f-Analysis)

4650. WELSBY, V. G., "Electronic Sector-Scanning Array," Electronic Techno., vol. 39, no. 1, pp. 13-18; January 1962. ABSTRACT: Two-element multiplicative array, used in conjunction with multi-frequency carrier waveform, can be made to give directional pattern comparable to narrow-band additive array having r times as many elements as there are frequency components in carrier waveform; signal information can be transmitted by applying amplitude modulation to whole carrier groupl electronic sector scanning is obtained by introducing time varying delay into one channel; suitable method described. (a-2, b-1, c-1, d-5, e-0, f-Analysis)

4651. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Urbana, Illinois Electrical Engineering Research Laboratories, RRL Report No. 10, Contract DA 36-039-sc-87264, ASTIA No. AD-273 962L; 31 January 1962. ABSTRACT: Efforts continued on the design of a radio direction finding system for the MF-HF-VHF range. Instrumentation and equipment procurement is discussed for the propagation research task. Instrumentation for the calibration of the interferometer system was completed. Studies of the VHF/UHF antenna for use in a phase comparison system continued. (a-1, b-3, c-1, d-1, e-508, f-See Abstract No. 4620)

4652. MONSER, G., AND CECIL, J., "Design and Development of Antenna Group for Direction Finder Sets AN/PRD-7 ( ) and AN/PRD-8 ( )," American Electronic Laboratories, Colmar, Pennsylvania, Progress Report No. 3, Contract No. DA 36-039-sc-84981, Report No. 60042-3, ASTIA No. AD-274 791; 31 January 1962. ABSTRACT: Effort continued on the design and development of the antenna group for direction finder sets AN/PRD-7( ) and AN/PRD-8. The status of mechanical component design and fabrication is outlined. Final electrical design dimensions of the Adcock antenna and its balun are indicated. Factors influencing design and test results are also indicated together with ideas for optimum design. Design, testing, and factors which influence the selection of antenna components are discussed. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4621)

4653. PICKENS, R. A., CLARK, M. C., HIGGINS, R. F., AND LYONS, B. J., "Wide Band Phased Arrays," Bendix Radio Division, Bendix Corporation, Baltimore, Maryland, Report No. L, Contract No. AF 30-602-2538, Project 1829, ASTIA No. AD-342 944; 31 January 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4654. ANDERSON, W. L., "Fields of Electric Dipoles in Sea Water - The Earth-Atmosphere-Ionosphere Problem," J. Res. Nat. Bur. Stand., vol. 66D, no. 1, p. 63; January-February 1962. ABSTRACT: The theory of extremely low frequency radio wave propagation from vertical and horizontal electric dipoles in a half space, separated by an infinite slab from another half space, is discussed and application is made to the specific case of the sea water-atmosphere-ionosphere problem, with dipoles located in the sea water. Each of the media is assumed homogeneous and isotropic. When attention is restricted to the frequency range 1 to 1,000 c/s, integration in the complex plane leads to consideration of the pole corresponding to the TEM mode of transmission and two branch cut integrals. One of these (that giving rise to propagation of energy along and in the ionosphere) is found to be important in the case of the horizontal dipole. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4655. DYSON, J. D., "A Survey of the Very Wide Band and Frequency Independent Antennas - 1945 to the Present," J. Res. Nat. Bur. Stand., vol. 66D, no. 1, p. 1; January-February 1962. ABSTRACT: The last few years have witnessed major developments in the field of antennas which are suitable for use over a range of frequencies. Operating bandwidths that were considered an impossibility as little as seven years ago are now readily available. To trace these developments, a brief historical survey of the literature in this field since the Second World War is presented. (a-1, b-1, c-1, d-1, e-0, f-Survey)

4656. WAIT, J. R., "On the Propagation of VLF and ELF Radio Waves When the Ionosphere Is Not Sharply Bounded," J. Res. Nat. Bur. Stand., vol. 66D, no. 1, p. 53; January-February 1962. ABSTRACT: Employing an idea of Brekhovskikh, an expression for the reflection coefficient of a continuously stratified ionized medium is derived. The result is in the form of a series whose first term is a Fresnel-type coefficient and succeeding terms account for the finite thickness of the transition layer. This result is then fitted into previously developed theory for propagation between a spherical earth and a concentric ionosphere. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4657. WALTERS, L. C., AND JOHLER, J. R., "On the Diffraction of Spherical Radio Waves by a Finitely Conducting Spherical Earth," J. Res. Nat. Bur. Stand., vol. 66D, no. 1, p. 101; January-February 1962. ABSTRACT: The theory for the diffraction of spherical electromagnetic waves by a finitely conducting spherical earth was developed from Maxwell's equations by Watson (1918) and the intricate computation details were later worked out by van der Pol and Bremmer (1936) as the now classical series of residues. Two aspects of this computation present considerable difficulty, especially at low frequencies: (1) The calculation of the height-gain factor which takes account of an elevated transmitter and/or receiver. (2) The evaluation of the special roots, $\tau = \tau_s$, of Riccati's differential equation,

$$\frac{d\delta}{d\tau} - 2\delta^2\tau + 1 = 0,$$

near the circle of convergence, $\delta^2\tau = 1/2$. These analytic difficulties are avoided with the aid of modern analysis techniques applied to a large scale electronic computer. Hankel functions of the first and second kind of order one-third and two-thirds are calculated by numerical integral methods and then used with iteration to solve Riccati's differential equation. The amplitude and phase of the spherical radio wave diffracted in the vicinity of the earth with various altitudes above the surface of the earth, or both the transmitter and the receiver, are then calculated by a summation of the series of residues. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4658. SHERRILL, W. M., AND TRAVERS, D. N., "Progress in the Development of a Twin Channel Spaced Loop Direction Finder and the Evaluation of the RACAL RA-17 and RA-390A Receivers," Southwest Research Institute, Interim Report No. 6, Contract NObsr 85086; 1 February 1962. ABSTRACT: Evaluation of the nonrotating coaxial spaced loop antenna for use with a twin channel receiver has shown that antenna pattern shape requirements are at least as stringent as those for previous spaced loop systems used with a single channel receiver. Prior development has shown the required pattern quality can be achieved but only after careful adjustment of geometry and difference connection circuitry. In order to investigate the properties of the 8-loop spaced array with a twin channel receiver without the inconvenience of prolonged crossover the geometry adjustments, a new spaced loop has been constructed which utilizes double shielded loops 2 feet on a side and 17-foot spacing. It is planned to reduce the size in the future. Progress in the investigation of sense systems for the twin channel spaced loop direction finder is summarized. The investigation of the use of the hybrid transformer in relation to the sense problem is outlined. The comparative evaluation of the RA. 17 and R-390A is approximately 60 percent complete. A general summary of the progress of the evaluation is given. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4623)

4659. ANONYMOUS, "Radio Location Techniques," Report No. 4, Phase 2, Contract AF 30(602)2214, ASTIA No. AD-328 283; 4 February 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4624)

4660. ANONYMOUS, "Evaluation of the AN/APS-88 Radar and AN/ALD-2 ECM Direction Finder Equipments in the S2F-3 Aircraft," Operational Test and Evaluation Force, Norfork, Virginia, Partial Report No. 2, Project O V12FY61, ASTIA No. AD-365 582; 5 February 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4661. JACOBSON, M. J., "Space Time Correlation in Spherical and Circular Noise Fields," Rensselaer Polytechnic Inst., Troy, New York, RPI MathRep. No. 50, Contract Nonr-59109, ASTIA No. AD-271 675; 5 February 1962. ABSTRACT: In this analysis, space-time correlation will be considered as a function of frequency, point separation, and time difference when the noise is generated by independent noise sources located on a sphere and circle of infinite radius. Numerous results are obtained, the most important being that, in general, noise cross-correlation will be very much greater for certain non-zero

time differences than for a zero time difference. The effects of inserted time delay must therefore be considered for systems in which noise cross-correlation may adversely affect performance. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4662. TRAVERS, D. N., AND COOPER, R. E., "Use of the Beverage Antenna in Wide Aperture High Frequency Direction Finding," Southwest Research Institute, San Antonio, Texas, Interim Report No. 5, Contract NObsr-85364, ASTIA No. AD-273 157; 7 February 1962. ABSTRACT: Investigations were made to determine the effectiveness of the beverage antenna as the basis of a wide aperture high frequency direction finder. Analytical findings and test results are presented for 2 working circular arrays differing in size. The characteristics and design parameters were studied of the single beverage antenna. The antenna had many useful properties for HF D/F including aperiodic impedance, highly directive azimuth patterns, wide aperture type response and very low installation cost and maintenance. Circular arrays and methods of communication were also studied. The circular array may be commutated in several ways, three of the most important being: (1) sequential switching, (2) simplified Wullenweber type goniometer scanning, and (3) sum-and-difference scanning with a twin channel receiver. It was concluded that the beverage antenna is suitable for wide aperture HF D/F with accuracy comparable to other types of wide aperture systems and at lower cost than any other known type. (a-1, b-3, c-1, d-1, e-600 and 1000, f-Experimental results. See Abstract No. 4625)

4663. ADAMSON, R., COPPA, P., AND FINOCCHIARO, P., "Development of Multi-Purpose Jamming Systems AN/VLQ-1, AN/MLQ-22, and AN/ALQ-37, Vol. I," American Electronic Laboratories, Colmar, Pennsylvania, Final Report, Contract DA 36-039-sc-78166, Project 3E54-01-001-04, ASTIA No. AD-329 484; 28 February 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

4664. ADAMSON, R., COPPA, P., AND FINOCCHIARO, P., "Inspection Test Report for Multi-Purpose Jamming System AN/ALQ-37, Volume III. Annex to Development of Multi-Purpose Jamming Systems AN/ULQ-1, AN/MLQ-22 and AN/ALQ-37," American Electronic Laboratories, Colmar, Pennsylvania, Final Report, Contract DA 36-039-sc-78166, Project 3E54-01-001-04, ASTIA No. AD-329 485; 28 February 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4665. DESTEFANO, J., "Direction Finder Group AN/TLA-9(XE-1)," Litton Systems, College Park, Maryland, Final Report, Contract DA 36-039-sc-84961, Project 3E44-02-001, ASTIA No. AD-278 679; 28 February 1962. ABSTRACT: The design, fabrication, and testing of the AN/TLA-9 Direction Finder group was completed. The system consists of a memory type indicator unit capable of displaying signals of 0.1 microsecond width and 0.1 volt amplitude. The servo unit controls the operation of two pedestals, one from 3-300 rpm, the other from 1-60 rpm. A stabilized sweep is provided to permit operation on a moving vehicle. The antenna is circularly polarized and capable of receiving signals in the 1.0 kmc to 10.75 kmc frequency range. A major problem of interstage pickup was encountered and solved by the use of decoupling networks and some re-packaging. Vibration test results indicated the need for additional mechanical support. The power supply was repackaged and stiffening members added to pedestal A and the indicator unit. Re-tests proved these modifications adequate. (a-1, b-3, c-1, d-1, e-0, f-Description. See Abstract No. 4607)

4666. CHEN, K. M., AND KING, R. W. P., "Loop Antenna Coupled to Four Wire Line," Proc. IEE, vol. 109, Part C., Monograph No. 462E; March 1962. ABSTRACT: Study of antenna in terms of 2 mutually perpendicular 2-wire lines that carry currents 90° out of phase, size of loop at which resonance occurs is determined; zero order and first order solutions of current distribution are evaluated, and it is found that at resonance, induced currents in loop, due to each 2-wire line, oscillate in dipole mode of loop currents induced by 4-wire line circulate as traveling wave; evaluation of radiation field pattern; square loop and circular loop. (a-3, b-1, c-1, d-5, e-0, f-Study)

4667. EMBRY, U. R., "The Probability of Intercepting Radio Signals Scattered by Meteor Trails," Stanford Electronics Laboratories, Stanford University, California, Report No. 773-1, Contract AF 30(602)-2398, ASTIA No. AD-333 636; March 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4668. PAVLOV, P. P., "Electromagnetic Field and Input Resistance of a Loop with Infinitely Long Cylindrical Ferrite Core Placed in a Conducting Medium," Radiotekhnika i Elektronika, vol. 7, no. 3, pp. 437-447, March 1962. See also Radio Engng. Electronic Phys., vol. 7, no. 3, pp. 411-421, March 1962. ABSTRACT: The input impedence of the coil, the propagation constant of the surface waves in the core, and the directivity and intensity gain in the spacial waves resulting from the present of the core, are studied theoretically. It is found that with a 2.8 cm dia. core in sea water, the reactive component of the impedence is mainly determined by the core surface waves over the frequency band 6 to 60 kc/s. This is true of the active component only in the lower part of this frequency range. (a-2, b-1, c-1 and 2, d-2, e-0, f-Experimental results)

4669. TSVETNOV, V. V., "The Threshold Sensitivity of Phased D Direction-Finders," Radiotekhnika, vol. 17, no. 3, pp. 48-60, March 1962. ABSTRACT: Calculates the s/n ratio at the input for which the root mean square deviation of the instantaneous phase error does not exceed a max permissible figure. Ideal phase-metering sections are considered, i.e., the reading is independent of signal amplitude. The more popular types of one and two-channel direction-finders are considered individually. Curves are drawn for some numerical examples. (a-2, b-2, c-2, d-2, e-0, f-Analysis)

4670. WILSON, C. L., "Pointing Errors in Simultaneous Lobing Antenna Systems," Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland, Project 503-05-023, ASTIA No. AD-608 997; March 1962. ABSTRACT: Pointing errors occur in monopulse systems when the geometry of operation is such that the ground between the system and target is illuminated. This analysis was made to determine the magnitude and form of these errors in a particular system operating under specified conditions. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4671. HAYDEN, E. C., "Correlation of D/F Errors with Ionospheric Radio Propagation Phenomena," Electrical Engineering Research Laboratories, University of Illinois, Urbana, Report No. 2, Contract AF 30(602)2413, Project 4505, ASTIA No. AD-282 364; 7 March 1962. ABSTRACT: The problem of estimating probable reliability or accuracy of specific sets of direction-of-arrival data and the problem of using knowledge of the ionosphere for the correction of such data for use in radio location are considered in the light of proved state-of-the-art techniques. The stated conclusions are that the solution to the first problem is dependent on the specific system involved, that no technique proposed for the solution of either problem has yet been adequately proved, and that further experimental and theoretical work on both areas is required. A brief description is given of some aspects of an experimental program (those aspects with which this contract is directly involved) designed to provide answers to the above questions. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4672. MAST, S. H., "Modification Kit MK-383(XE-1)/TRD for Direction Finder Group OA-1034(XE-1)/TRD," Litton Systems, College Park, Maryland, Final Report, Contract DA 36-039-sc-74901, Project 3-44-02-527, ASTIA No. AD-274 928; 23 March 1962. ABSTRACT: The task of designing and building a modification kit to extend the frequency range of the Direction Finder Group OA-1034(XE-1)/TRD from its 230 mc limit to a 4500 mc limit, and to provide both switched lobe and single lobe operation, was undertaken by this organization. This was to be accomplished by the use of five bands covering the following frequencies: A, 160 to 320 mc; B, 300 to 600 mc; C, 550 to 1100 mc; D, 1000 to 2600 mc; and E, 200 to 4500 mc. Three antenna arrays were successfully developed for bands A, B, and C to be used in complete compatibility with the components of the Direction Finder Group. Unforeseen difficulty led to the deletion of the requirements of bands D and E. A target transmitter and antenna was also developed to simulate a signal source for testing and aligning the system. Fifteen units of the modification kit were successfully fabricated and delivered in accordance with contract requirements. (a-1, b-3, c-1, d-1, e-0, f-Project summary)

4673. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System in the MF-HF-VHF Range," University of Illinois, Electrical Engineering Department, Report No. 11, Contract No. DA 36-039-sc-87264, ASTIA No. AD-276 571; 31 March 1962. ABSTRACT: Efforts were continued on a definite program of instrumentation and experiments for the propagation research task. The use of the NBS Transmission curves in RDF station fixing was considered. Instrumentation for the sadist RDF system was installed at a field station and satisfactory operation of the interferometer-type RDF system was achieved. Studies of the VHF/UHF antenna for use in a phase comparison type RDF system were continued. (a-1, b-3, c-1, d-1, e-508, f-See Abstract No. 4651)

4674. DEAN, W. N., AND WATTS, P. C., "Nuclear Detonation Evaluation System AN/GSQ-44 Redundancy Analysis, Addendum," Sperry Gyroscope Co., Great Neck, New York, Project 4662, Contract AF 30(602)2311, ASTIA No. AD-332 203, Addendum to Report No. CA-4223-0061, AD-326 329; April 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4675 HANSEN, J., AND LARSEN, T., "The Electric Field at the Ground Plane Near a Disk-Loaded Monopole," J. Res. Nat. Bur. Stand., vol. 66D, no. 2, p. 205; March-April 1962. ABSTRACT: In calculating ground losses for antennas with a ground-wire system, it is necessary to know the vertical electric-field strength and the tangential magnetic-field strength at the surface of the ground. In this paper the vertical electric-field strength at the ground plane near the base of an electrically short vertical antenna with a top loading in the shape of a circular disk is calculated. Numerical computations are carried out to some extent. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4676. KOCH, J. W., AND PETRIE, H. E., "Fading Characteristics Observed on a High-Frequency Auroral Radio Path," J. Res. Nat. Bur. Stand., vol. 66D, no. 2, p. 159; March-April 1962. ABSTRACT: Observations of fading characteristics of high-frequency signals have been carried out on a long path (4,470 kilometers) passing through the auroral zone. Statistics were obtained on fading rate, short-term carrier amplitude fluctuations, and fade durations. Fading rates higher than 20 cycles per second were observed for a small percentage of the time at each of the three carrier frequencies used, and show only a minor diurnal trend, with the maximum usually occurring during the early morning hours. Rayleigh distributions of carrier envelope amplitude were obtained for many of the observations; however, fading depth was normally reduced during periods of rapid fading. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4677. STURROCK, P. A., "Generation of Radio Noise in the Vicinity of the Earth," J. Res. Nat. Bur. Stand., vol. 66D, no. 2, p. 153; March-April 1962. ABSTRACT: A tentative classification of possible sources of radio noise in the vicinity of the earth may be obtained by examining separately available sources of power and known mechanisms for conversion of this power. Among the former we may list high-energy electrons such as those trapped in the Van Allen belts; the solar wind; bursts of high-energy particles ejected by the sun; shock waves in the interplanetary medium originating on the sun; and the rotational energy of the earth. Mechanisms of conversion may be classified as "direct," such as synchrotron and Cerenkov radiation, and "indirect." Indirect conversion involves the excitation of an intermediate state by the available sources of power and subsequent radiation by this state. This intermediate state may be localized heating, the formation of unstable current patterns, the acceleration of particles, or the generation of waves which are themselves non-radiative, such as plasma oscillations. The following mechanisms which are relevant to the generation of radio noise receive special attention: Cerenkov radiation, two-stream instability, and the coupling of waves by inhomogeneity and nonlinearity. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4678. MONSER, G., AND CECIL, J., "Design and Development of Antenna Group for Direction Finder Sets AN/PRD-7( ) and AN/PRD-8( )," American Electronic Laboratories, Colmar, Pennsylvania, Progress Report No. 4, Contract No. DA 36-039-sc-84981, Report No. 60042-4, ASTIA No. AD-277 969; 30 April 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4652)

4679. SYDNOR, R. L., "An Investigation of Space Diversity Radio Direction Finding," University of Illinois, Urbana, Illinois, Electrical Engineering Research Laboratories, Technical Report No. 17, Contract Nonr-183402, Project NR 371-161, ASTIA No. AD-286 032; 30 April 1962. ABSTRACT: The object of this investigation is to determine how far apart radio direction finders should be placed in order to obtain statistically independent samples, and to establish the number of radio direction finders to be included in the ensemble average. The conclusions are based upon high frequency radio direction finder bearing data observations obtained from two small aperture radio finders separated by a variable distance. Crossed-Adcock type direction finders were used and the separation distance was varied from 1/32 to 1/4 mi. The data were obtained over a period of approximately one yr during the time when conditions in the ionosphere were normal. (a-1, b-3, c-1, d-1, e-0, f-Study and investigation)

4680. WILLIAMS, C., AND BEUKERS, J. M., "AN/TRD-15 Automatic Readout," Servo Corporation of America, Long Island, New York, Final Report, Contract DA 36-039-sc-87279, Report No. 27900, ASTIA No. AD-278 258; 30 April 1962. ABSTRACT: A description is given of the research and development program directed towards providing the AN/TRD-15 high frequency doppler direction finder with an automatic azimuth readout capability and a manual elevation angle display. The work was divided into two phases: (1) an investigation to determine the best time to read the azimuth information; and (2) development of a breadboard model to demonstrate an automatic readout capability. The investigation confirmed the belief that D/F operator's function is complex and not reproducible using simple logic circuits. An analogue statistical treatment of azimuth information is used in a breadboard model which demonstrates satisfactorily an automatic readout system. Azimuth information is displayed in digital form locally and available in teletype form for transmission to a remote location. (a-1, b-3, c-1, d-1, e-0, f-Continued study and investigation. See Abstract No. 4634)

4681. BEVERAGE, H. H., NORTON, K. A., ET AL., "Antennas and Propagation," Proc. IRE, vol. 50, no. 5, pp. 679-718; May 1962. ABSTRACT: Miscellaneous papers with the following titles: "Early History of Antennas and Propagation Field Until End of World War I," P.S. CARTER, H.H. BEVERAGE; "Radio Wave Propagation to End of World War I," C.R. BURROWS; "Antennas and Propagation Field between World Wars," L.J. CHU; "Radio-Wave Propagation between World Wars," S.S. ATTWOOD; "Contributions to Antenna Field during World War II," L.C. VAN ATTA, S. SILVER; "Radio-Wave Propagation during World War II," K.A. NORTON; "Advances in Antennas and Propagation since World War II," E.C. JORDAN, R.W.P. KING; "Radio Propagation following World War II," L.A. MANNING; "Future of Antennas," M.D. ADCOCK, R.E. HIATT, K.M. SIEGEL; "Future of Propagation Research and Development," H.G. BOOKER. (a-3, b-1, c-1, d-1, e-0, f-Historical review)

4682. ANONYMOUS, "Design and Test of Experimental Model Radar Video Processor for Automatic Detection Volume I and II," General Atronics Corporation, Conshohocken, Pennsylvania, Final Report, Contract NObsr 81578, Project 6850 27110, ASTIA Nos. AD-358 840 and AD-358 841; May 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4683. BEVERAGE, H. H., "Antennas and Transmission Lines," Proc. IRE, vol. 50, no. 5, pp. 879-884; May 1962. ABSTRACT: Antennas and transmission lines used in long distance point to point radio communication are described with respect to design parameters of long wave transmitting antennas, development of arrays and long wire types of antennas for short wave transmission and reception, and parameters which enter into design of open-wire and coaxial transmission lines. (a-3, b-1, c-1, d-1, e-0, f-Theory and analysis)

4684. FISCHER, F., "Fully Electronic Experimental Installation of Long Base Doppler Direction Finder," Zeit Fuer Flugwissenschaften, vol. 10, no. 4-5, pp. 191-202; April-May 1962. ABSTRACT: Automatic device for direction finding, which, applying Doppler effect, enables indirect direction finding to be carried out from ground without additional equipment being required aboard aircraft; underlying theory and problems involved; description of installation. (a-2, b-3, c-4, d-4, e-0, f-Experimental analysis)

4685. HARRISON, C. W., "Scattering Error in Radio Interferometer," Trans. IRE, vol. AP-10, no. 3, pp. 273-276; May 1962. ABSTRACT: Error in interferometer angle measuring system is investigated theoretically and numerically; model employed consists of 4 identical base-loaded vertical antennas erected at corners of square; assumption is made that earth is perfectly conducting plane of infinite extent. (a-2, b-1, c-1, d-1, e-0, f-Theory)

4686. JORDAN, E. C., AND KING, R. W. P., "Advances in the Field of Antennas and Propagation Since World War II: Part 1-Antennas," Proc. IRE, vol. 50, no. 5; May 1962. ABSTRACT: Progress in the quantitative understanding of antennas as circuit elements, transmitters, receivers and scatterers of electromagnetic radiation is reviewed briefly for the period 1945-1961. Advances in the design of selected radiating systems with special properties are indicated. Specific reference is made to the impedance, current distribution, and pattern characteristic of cylindrical dipoles, singly and in arrays. Particular developments touched upon include slot and surface wave antennas, microwave antennas and microwave lenses, super-gain antennas, and very large antennas and arrays for radio astronomy and satellite communication. Frequency-independent "angle" antennas and log-periodic structures are reviewed briefly. (a-2, b-1, c-1, d-1, e-0, f-See Abstract No. 4681)

4687. KING, R. W. P., AND SCHMITT, H. J., "The Transient Response of Linear Antennas and Loops," Trans. IRE, vol. AP-10, no. 3, pp. 222-228; May 1962. ABSTRACT: The transient response of straight wires and circular loops when short pulses are applied is studied experimentally and theoretically. It is shown that the initial response is always that of an infinitely long antenna at a frequency near the upper limit of the frequencies contained in the pulse provided this is sufficiently short so that the first reflection from the end of the wire or loop is not superimposed on it. (a-2, b-1, c-1, d-1, e-0, f-Study and investigation)

4688. NORTON, K. A., "Radio-Wave Propagation during World War II," Proc. IRE, vol. 50, no. 5, pp. 698-704; May 1962. ABSTRACT: Many publications have appeared which describe the very extensive wartime radio-wave propagation research. References to some of these summaries are given which cover some aspects of this research as carried out in the United States, England, the U.S.S.R., Japan and Germany. These summaries are most complete for the work done in the United States, England, and Japan. A summary is then given of some of the wartime research in the United States on direction finders and the polarization of downcoming ionospheric radio waves. This is followed by some heretofore unpublished material on Japanese ionospheric research which, by way of example, clearly indicates that an April, 1942, paper by Maeda, Uyeda and Shinkawa contains the first definite identification and interpretation of the F2-layer longitude effect. Finally a brief summary is given of a few selected topics in propagation research which arose out of the wartime development of radar. The paper includes a review of studies of polarization errors in direction finders and provides a bibliography of 62 entries, ten of which are declassified reports concerning direction finders which were retained during World War II. (a-5, b-1, c-1, d-1, e-528, f-See Abstract No. 4681)

4689. SMITH, G. S., "Antenna Group for Direction Finder Set AN/PRD-5," Systems Inc., Orlando, Florida, Final Report, Contract DA 36-039-sc-78352, ASTIA No. AD-404 554; May 1962. ABSTRACT: The development model and service test model of the antenna group is described. When used with a companion radio receiver, the antenna group functions as a Direction Finder over the frequency range 0.5 to 20 mc. The antenna group is man-portable; it can be operated in either an aural or visual mode, and the system can be operated at distances of up to 100 ft from the antenna. The design objectives for the 25-inch loop antenna system include achieving a sensitivity of 5 uv/m below 2 mc and 2 uv/m above 2 mc, 10 watts total power dissipation, 60 rpm maximum antenna rotation speed, 1 degree opposite null deviations, and null depths greater than 30 db. In addition, the design objective for the sense pattern includes achieving a front-to-back lobe ratio of at least 6 db. In general, the development model of the antenna group equals or exceeds these specifications. The report covers system performance and individual unit design. Improvements made in the service test model are described. Photographs and schematic diagrams are included. (a-1, b-3, c-1, d-1, e-0, f-Description)

4690. SOPCZAK, R. R., "Neptune UPD-501 Spiral Antenna Evaluation," Central Experimental and Proving Establishment, CEPE Report No. 1634, ASTIA No. AD-331 436; May 1962. ABSTRACT: Not available. (a-3, b-3, c-1, d-7, e-0, f-0)

4691. WILSON, C. L., "Pointing Errors in Sequential Lobing Antenna Systems," Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland, BRL TN1463, Project 503-05-023, ASTIA No. AD-609 009; May 1962. ABSTRACT: Angular pointing errors are introduced in sequential lobing antenna systems by reflection from the ground between the antenna system and the target. This theoretical analysis of a particular system operating under certain specified conditions was conducted to determine the magnitude and character of these errors and provide a basis for comparison with other types of antenna systems. A number of graphs showing the results of this study are included in this report. (a-1, b-3, c-1, d-1, e-0, f-Theoretical analysis. See Abstract No. 4670 for similar report on subject by same author)

4692. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Progress in the Development of a Twin-Channel Spaced Loop Direction Finder," Southwest Research Institute, Interim Report No. 7, Contract NObsr 85086; 1 May 1962. ABSTRACT: The development of the spaced loop twin channel D/F system is reviewed. The RA. 153 twin channel receiver has been received and performance data are reported. The performance of the 8-loop array (crossed coaxial spaced loops) is described both for individual antenna patterns and for tests in conjunction with the RA. 153 twin channel receiver. The planned advanced laboratory version of the spaced loop D/F system is discussed along with additional instrumentation for the system. The application of digital techniques to automatic bearing readout is briefly discussed. The development progress of a hybrid transformer is given. Current work on component resolution is described. Other phases of the project work are covered briefly. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4658)

4693. COOPER, R. E., AND TRAVERS, D. N., "Sixth Interim Report: The Beverage Direction Finder. Interim Development Report for a Study Technique to Produce a High Frequency Land Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, Contract No. NObsr-85364; 9 May 1962. ABSTRACT: Initial phases (ordering of materials, site survey, etc.) of construction of a minimum land area 360° array of Beverage antennas, 300 meters long, 2° apart in azimuth, have been started. A time based linear display, using a solid state diode commutator has been tested. Under development is a simple method of using this commutator with a polar display on the DAQ indicator. A more extensive development leading to a larger, more accurate, and permanent polar display has been started. Initial investigation of high angle of elevation signals has been started using a mobile transmitter. This transmitter has been sent out to distances of 150 miles. Results are not yet complete. Work on extension of the theory of the Beverage antenna has been continued at a limited rate. (a-1, b-3, c-1, d-1, e-1000, f-Interim Report. See Abstract No. 4662)

4694. SMITH, H. B., KAISER, J. A., AND OTHERS, "A Miniature Automatic Direction Finder," Diamond Ordnance Fuze Laboratories, Washington, D.C., Report No. TR-1031, DOFL Project 26100, ASTIA No. AD-276 282; 14 May 1962. ABSTRACT: A miniaturized unambiguous direction finder with no moving parts is described. At a frequency of 1000 mc, a complete system, consisting of a two-wire spiral antenna, with cavity backing, operating in the first two radiation modes can be built into a cylinder 10 in. in diameter and 3 in. deep. Direct scaling laws apply, so that at 2000 mc, for example, the cylinder would be 5 in. in diameter and 1-1/2 in. deep. Since there are no moving parts, and printed-circuit techniques can be used, the total weight (excluding power supply and readout or display) will be less than 1/2 lb. The pattern of this antenna array gives hemispheric coverage. The output, fed into an analog device, gives a determination of the elevation and azimuth of a received signal, with no ambiguities, in the hemisphere bounded by the plane of the spiral. The processing network consists of two 3-way power dividers and a pair of hybrids, which can be mounted on the back of the cavity by using strip-line techniques. An experimental version of the system has been built and preliminary data are presented. (a-1, b-3, c-1, d-1, e-0, f-Description)

4695. SHERRILL, W. M., MOORE, J. D., AND TRAVERS, D. N., "Comparative Evaluation of the Racal RA. 17C-12 and Collins-Motorola R-390A/URR Receivers," Task Summary Report Number XI, Contract NObsr-85086, Southwest Research Institute, 15 May 1962. ABSTRACT: Data are presented for a comparative evaluation of the Racal RA. 17C-12 and R-390A/URR communications receivers. Receiver performance data obtained include sensitivity, selectivity, dynamic range, stability, receiver radiation, overload, image and IF rejection, and spurious response. Special emphasis was placed on obtaining directly comparable data. On the basis of the receiver evaluation, a summary comparison is given of the salient performance characteristics affecting the general countermeasures capabilities of the two receivers. It is concluded that both receivers are suitable for contemporary military applications with the choice of the superior receiver possible only in terms of specific applications. As an example (many alternate examples could be given), it was found that the RA. 17C had greater sensitivity under certain test conditions, while the R-390A had greater freedom from spurious responses. The choice of the superior receiver is therefore related to what minimum acceptable performance is required. (a-1, b-3, c-1, d-1, e-1000, f-Summary report)

4696. ANDREASEN, M. G., "A Study of the Wire Grid Lens," TRG, Inc., Palo Alto, California, Contract No. AF 30(602)2742, ASTIA No. AD-296 364; June 1962. ABSTRACT: This report presents a study of some of the problems that are of importance in the design of a wire-grid lens of the circularly symmetry type. The first problem investigated is that of a double-wire square-mesh grid which will very often be used near the rim of the lens to keep the grid-to-grid spacing suitably small. Design formulas for the quasi-static equivalent dielectric constant of such grids have been derived. The validity of these formulas was tested experimentally. Another problem that was investigated is that of synthesizing the index of refraction in a circularly symmetric lens when the index of refraction is specified in part of the lens and when it is required that the rays leaving the lens must form a collimated beam in as large an aperture as possible. Design formulas representing the solution of this problem have been derived. These

formulas are most useful for wire-grid lens designs because the grid-to-grid spacing in the outer part of the lens is often determined by mechanical considerations rather than by electrical considerations. (a-1, b-3, c-1, d-1, e-0, f-This report is believed to be the predecessor to a Rome Air Development Center Report (RADC-TDR-62-211) dated December, 1963)

4697. BAZER, J., AND KARP, S. N., "Propagation of Plane Electromagnetic Waves Past A Shoreline," J. Res. Nat. Bur. Stand., vol. 66D, no. 3, p. 319; May-June 1962. ABSTRACT: The problems of the diffraction of homogeneous plane waves and ground waves by a linear shoreline in a planar land-sea surface are discussed. The direction of propagation of these incident waves is assumed perpendicular, and that of their magnetic vectors parallel, to the shoreline. At the air-land interface, the customary impedance boundary condition is imposed while the sea is treated as a perfect conductor; atmospheric and ionospheric effects are ignored. Exact integral representations of the solutions are presented. In the case of homogeneous plane-wave excitation originating over the sea, the integral representations are employed to obtain expressions for the geometrical optics field and for the far-field form of the remaining scattered field, transition regions included. The possibility of coastal refraction is discussed. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4698. BECKMANN, P., "Statistical Distribution of the Amplitude and Phase of a Multiply Scattered Field," J. Res. Nat. Bur. Stand., vol. 66D, no. 3, p. 231; May-June 1962. ABSTRACT: The probability distribution of the amplitude and phase of the sum of a large number of random two-dimensional vectors is derived under the following general conditions: Both the amplitudes and the phases of the component vectors are random, the distributions being arbitrary within the validity of the Central Limit Theorem; in particular, the distributions of the individual vectors need not be identical, the amplitude and phase of each component vector need not be independent and the distributions need not be symmetrical. The distributions formerly derived by Rayleigh, Rice, Hoyt, and Beckmann are shown to be special cases of this distribution. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4699. POLK, C., AND FITCHEN, F., "Schumann Resonances of the Earth-Ionosphere Cavity - Extremely Low Frequency Reception at Kingston, R.I.," J. Res. Nat. Bur. Stand., vol. 66D, no. 3, p. 313; May-June 1962. ABSTRACT: Since June 1961 magnetic fields of natural origin in the 5 to 20 c/s frequency range have been recorded in Kingston, R.I. The experimental equipment is described briefly, and results are presented. Variations with time of the first resonant frequency of the earth-ionosphere cavity are indicated, and effects of solar activity are discussed. An analysis of the envelope of recorded wave trains shows only fair agreement with existing theory. (a-1, b-1, c-1, d-1, e-0, f-Experimental analysis)

4700. WHALE, H. A., "Ionospheric Irregularities and Long-Distance Radio Propagation," J. Res. Nat. Bur. Stand., vol. 66D, no. 3, p. 265; May-June 1962. ABSTRACT: A study and interpretation of many effects observed in the reception of short-wave radio signals over long distance propagation paths. Particular attention is paid to the day-to-day wanderings of the apparent direction of arrival about its mean position. The importance of these wanderings with respect to the design of receiving antennas is discussed, as it has been found that once the regular diurnal variations have been established for medium distance circuits, considerable advantage can result from a reduction of the beam widths in the horizontal plane of antennas commonly in use. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

4701. ANONYMOUS, "Systems Techniques Research," Stanford University, Stanford Electronics Laboratories, Final Quarterly Status Report, Contract AF 44(616)7944, ASTIA No. AD-331 872; 30 June 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4702. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Urbana, Illinois, Electrical Engineering Research Laboratories, Quarterly Report No. 4, Contract DA 36-039-sc-87264, ASTIA No. AD-285 040; 30 June 1962. ABSTRACT: Phase shifters, design, installation. Identifiers: Sadist. Initial instrumentation for the propagation research task was completed. The effect of vertical angle of arrival on a traveling-wave antenna RDF system are considered. Progress in the systems engineering for the MF and HF radio direction finders is discussed. The use of the Scott transformer connection at MF for three-phase to two-phase transformation appears practical. The use of passive RC element type broadband 90 degrees phase shift networks in a sum-and-difference type phase meter was considered. Improvements which extend the effectiveness of the interferometer calibrator are described. Concerning the VHF system for radio direction finding. It is shown how the frequency dependent phase center position on a conical equiangular spiral antenna affects the elevation angle response. An improvement may be realized by orienting the conical antenna with its apex toward the earth. (a-1, b-3, c-1, d-1, e-508, f-Progress report. See Abstract No. 4673)

4703. WHEELER, W. R., "Research on New Types of ECM and DF Aircraft Antenna Systems for the Frequency Range 50-1000 Mc," Denver Research Institute, Denver, Colorado, Final Report, Contract NOa(s) 60-6031-c, ASTIA No. AD-330 065; 30 June 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4704. ANONYMOUS, "Bibliography of Unclassified NRL Formal Reports Numbers 1000 to 5700," USN, NRL Report No. 5700B, July 1962. ABSTRACT: This Bibliography is divided into three sections. Section 1 lists numerically only the Unclassified NRL formal reports 1000 to 5700 giving the number and publication date at the left of the column and the title and authors at the right, below is the Office of Technical Services' PB number and price. If a microfilm or photostat price is quoted, the item may be purchased from Chief, Photo Duplication Service, Publication Board Project, Library of Congress, Washington 25, D.C.; check made payable to Chief, Photo Duplication Service. If mimeograph price is quoted the item may be purchased from the Office of Technical Services, Department of Commerce, Washington 25, D.C.; check made payable to Treasurer of the United States. Section 2 is an alphabetical author index and Section 3 is an alphabetical listing of series titles. A subject index is not contemplated. (a-1, b-3, c-1, d-1, e-785, f-Bibliography)

4705. GIGER, A., "The Construction of Antenna Arrays for Prescribed Radiation Patterns (Antenna Synthesis)," Ministry of Aviation (British), Translation no. TIL/T 5305, ASTIA No. AD-286 440; July 1962. ABSTRACT: The theoretical and practical research on new glide path installation is described. The subsequent, purely theoretical investigations are based on the same problem, and deal with three other possible solutions. The last of these is of more general interest, because it gives methods for realising any desired radiation diagram, although the calculation is only easy in the case where the dimensions of the antennae are small. Such antennae, arbitrarily small compared with the wavelength and with arbitrarily concentrated beams, also known as super gain antennae, are dealt with in detail in the last part, and their fundamental difficulties which militate against their practical realisation are pointed out, e.g., low radiation, poor efficiency, narrow band, high accuracy for the feed voltages, and the disturbing effect of objects in the vicinity of the antenna. (a-1, b-3, c-1, d-4, e-0, f-Translation of thesis)

4706. IIZUKA, K., AND KING, R. W. P., "The Dipole Antenna Immersed in a Homogeneous Conducting Medium," Trans. IRE, vol. AP-10, no. 4, pp. 384-392; July 1962. ABSTRACT: It is the object of this investigation to measure the driving-point admittance, the amplitude distribution of the current, and the phase distribution of the current, relative to the phase at the driving-point for a dipole antenna immersed in a homogeneous conducting medium. Measurements of the driving-point admittance have been made for a range of values of the ratio $\sigma/\omega\epsilon_r\epsilon_0$ of the medium taking the electrical height of the antenna βh as a parameter. The ratio $\sigma/\omega\epsilon_r\epsilon_0$ is varied from $\sigma/\omega\epsilon_r\epsilon_0 = 0.036$ to $\sigma/\omega\epsilon_r\epsilon_0 = 8.8$ and the antenna height βh is varied from $\beta h = 0.1$ to 2π at intervals of 0.1. The amplitude and phase distributions of the current have been measured for $\beta h = \pi/2$, $3\pi/4$, π, and $5/4\pi$ in a homogeneous conducting medium whose conductivity is varied from $\sigma/\omega\epsilon_r\epsilon_0 = 0.036$ to $\sigma/\omega\epsilon_r\epsilon_0 = 8.8$. (a-1, b-1, c-1, d-1, e-0, f-Experimental investigation)

4707. LORD, R. D., BELLROSE, F. C., AND COCHRAN, W. W., "Radiotelemetry of the Respiration of a Flying Duck," Science, vol. 137, pp. 39-40; July 1962. ABSTRACT: Respirations of a flying wild mallard duck, Anas platyrhynchos, appear to be synchronized with wing beat in a ratio of 1 to 2. Wing beats come during exhalation and between respirations. The average number of respirations was 14 per minute for a resting duck and 96 per minute for a flying duck. (a-1, b-2, c-1, d-1, e-0, f-Biotelemetry)

4708. MCNELIS, D. D., AND SWARM, H. M., "Bearing Angle Measurements in r.f. Systems Having Normally Distributed Arrival Angle with Unknown Variance," IRE Trans., vol. AP-10, no. 4, pp. 470-471;

July 1962. ABSTRACT: The errors of a direction finding system may be obscured by random fluctuations in the angle of arrival of the radio signal under observation. By averaging over a series of observations the effects of these fluctuations can be minimized. Relationships are derived between the probability that this average will fall within a given confidence interval of the true angle and the variance of the probability distribution of the angle of arrival of the signal. (a-2, b-1, c-1, d-1, e-0, f-Analysis)

4709. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Progress Report No. 7, Contract DA 36-039-sc-84966, ASTIA No. AD-296 165; July 1962. ABSTRACT: Progress is reported on efforts to develop the techniques and equipments for demonstrating the partial automation of a tactical direction-finding system. The construction of equipments was essentially completed and the talk of planning for the installation of these equipments in an actual radio direction-finder system was begun. It is proposed that the direction-finder station at Menlo Park, California, and slave direction-finder stations at both Bozeman, Montana, and Seattle, Washington, and that this direction-finder system be operated as a position location network to collect engineering data for performance-evaluation. The possible application of the remote-tuned HF radio receiver system, developed on this project, in communication networks is briefly discussed. (a-1, b-3, c-1, d-1, e-511, f-Progress report. See Abstract No. 4648)

4710. MOORE, J. D., AND TRAVERS, D. N., "Status of the 8-Loop Antenna," Southwest Research Institute, Task Summary Report Number XII, Contract NObsr-85086; 11 July 1962. ABSTRACT: The progress on the development of the 8-loop antenna is reviewed. This antenna has the advantages of the spaced loop antenna for shipboard direction finding, but with no moving parts required at mast top or in the antenna. The feasibility of the 8-loop antenna for use with a goniometer system or a twin channel system is discussed. Current work on the project is discussed with emphasis on an advanced 8-loop goniometer system. The fixed 8-loop (crossed spaced loops) and rotating spaced loop antennas are compared by listed known advantages and disadvantages of each system. A comparison of the goniometer technique and twin channel technique is made by the same method. (a-1, b-3, c-1, d-1, e-1000, f-Review. See Abstract No. 4695)

4711. ANONYMOUS, "Research in Connection with Propagation of Very Low Frequency (VLF) Waves," Battelle Institute, Frankfurt am Main, ASTIA No. AD-285 478; 31 July 1962. ABSTRACT: The VLF-receiving station in Frankfurt, Maine is continuously monitoring the transmitter NBA (18 kc/s) with regard to slow phase and amplitude; the transmitter GBR (16 kc/s) is monitored with regard to fast phase and amplitude. The basic design of the receiving station was developed at the National Bureau of Standards. The investigations performed in Frankfurt am Main were aimed at increasing the reliability of this station and finding possibilities of improvement. The present report gives a description of improvements ensuring optimum accuracy of recording and the independence of the amplitude channel with regard to the keying ratio of the received transmitter (fill-in signal technique). Furthermore, an exclusively electronic phase and amplitude meter no longer containing any mechanically moved parts is reported on. The response time achieved by this electronic phase meter is short enough (approximately 0.1 sec for 180° phase shift) that few Morseignals supply a phase indication. The analyses of the records obtained were started in January 1962, since first of all sufficient material and experience had to be gathered. The records of the transmitter NBA, whose signal characteristic in Frankfurt am Main is determined by the sky wave, clearly show the diurnal and seasonal phase variations. Contrary to this, the records of the transmitter GBR - where both the sky wave and the ground wave have a marked influence - show a less clear phase and amplitude behavior. The GBR phase characteristic which cannot yet be fully interpreted has proved to be of great interest. All observed phase anomalies on the propagation paths NBA-Frankfurt am Main and GBR-Frankfurt am Main are discussed in the report. (a-1, b-3, c-1, d-4, e-920, f-Propagation study)

4712. MONSER, G., AND CECIL, J., "Design and Development of Antenna Group for Direction Finder Sets AN/PRD-7( ) and AN/PRD-8( )," Progress Report No. 5, Contract DA 36-039-sc-84981, ASTIA No. AD-290 335; 31 July 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No 4678)

4713. ANONYMOUS, "Project Michigan," Institute of Science and Technology, University of Michigan, Ann Harbor, Quarterly Progress Report, Contract No. DA 36-039-sc-78801, ASTIA No. AD-331 206, August 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4714. HARRIS, F. B., AND TANNER, R. L., "A Method for the Determination of Lower Ionosphere Properties by Means of Field Measurements on Sferics," J. Res. Nat. Bur. Stand., vol. 66D, no. 4, p. 463; July-August 1962. ABSTRACT: The propagation of audiofrequency and sub-audiofrequency waves between the earth and an ionosphere whose conductivity varies continuously with altitude is considered in detail. The fields are represented in terms of two scalar potentials satisfying appropriate wave equations in spherical coordinates. It is shown, on the basis of existing data on the ionosphere, that waves in this frequency range can be considered to be confined to a thin, but not sharply bounded, spherical shell about the earth. Greatly simplified radial wave equations in dimensionless form are derived incorporating this approximation. Solutions of these equations are given for two regions, viz, for the low-altitude region where $\sigma/\omega\epsilon_0 << 1$ and, in the case of certain restricted types of conductivity profile, for the high-altitude region where $\sigma/\omega\epsilon_0 >> 1$. An iterative method is presented, based on an integral equation, which makes possible a computation of the radial wave function in the transition region and a joining of interior and exterior solutions for the propagating TM mode. The result is a direct mathematical relationship between the conductivity profile and the complex propagation constant as a function of frequency. It is demonstrated that at frequencies above about 50 cycles the propagation constant can be obtained from measurements of the horizontal components of electric and magnetic fields in individual sferics at airplane altitudes, while at lower frequencies the same information can be obtained through ground-based observation of cavity resonance effects in sferic noise. Existing data on these cavity resonances are used to calculate the complex propagation constant as a function of frequency from 6 to 34 cycles. The results, when extrapolated to higher frequencies, predict attenuation rates in excellent agreement with currently available data. The effect of the diurnal variation in conductivity on observable quantities is briefly examined, and tentative conclusions as to its magnitude are drawn. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

4715. KRAICHMAN, M. B., "Impedance of a Circular Loop in an Infinite Conducting Medium," J. Res. Nat. Bur. Stand., vol. 66D, no. 4, p. 499; July-August 1962. ABSTRACT: Expressions are derived for the resistance and reactance of a circular loop of thinly insulated wire which carries a uniform current and is immersed in a conducting medium. The result for the resistance is compared with that known for a circular loop in a spherical insulating cavity. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4716. RAWER, K., "Propagation Problems with Space Radio Communications," J. Res. Nat. Bur. Stand., vol. 66D, no. 4, p. 375; July-August 1962. ABSTRACT: Ionospheric and tropospheric refraction and absorption influence earth-space propagation. The relative importance of the ionospheric influence is considerably larger than in terrestrial propagation. Apart from the effects of this latter known from experience, some new phenomena have been observed, viz, special cases of antipode reception, field-strength scintillations and blackouts. Specific phase effects have been observed: the Doppler-effect is due to the satellites quick movement, the Faraday effect is caused by the presence of double refraction in the ionosphere. Both effects present some difficulties for most applications. The most important tropospheric effects are molecular absorption and the corresponding statistical noise. (a-1, b-1, c-1, d-1, e-0, f-Observation and analysis)

4717. WAIT, J. R., "An Analysis of VLF Mode Propagation for a Variable Ionosphere Height," J. Res. Nat. Bur. Stand., vol. 66D, no. 4, p. 453; July-August 1962. ABSTRACT: An approximate treatment of modes in a waveguide of variable width is presented. It is assumed that the boundaries satisfy impedance-type boundary conditions. The model consists of two parallel plate waveguide regions connected by a linearly tapered section. The results have application to the theory of VLF radio wave propagation when the ionospheric heights are not constant along the path. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

4718. ZIEHM, G., "Fundamentals of a General Theory of the Direction-Finding Error on Ships. I.," Frequenz, vol. 16, no. 8, pp. 281-293; August 1962. ABSTRACT NO. 1: The aim is to derive, in the series presentation desired by the practical engineer, formulae for the higher frequencies as well as the lower frequencies considered by Maurer and Fischer in 1926. Analysis shows that the action of an interfering field may be regarded as equivalent to that of two inversely rotating finding errors and the minimum flattening of both fields. The azimuth dependence of fields for the principal interfering radiator arrangements is investigated, and a general formula is derived which gives the relation between the direction-finding error and minimum flattening in an implicit form for the case of n arbitrary interfering radiators. This formula is so arranged that for the principal special cases encountered

in practice the desired series expressions are obtained. A circuit, which is closely analogous to the actual conditions, serves for numerical evaluations, the results obtained being shown in numerous diagrams. ABSTRACT NO. 2: In 1926, H. Maurer and F. Fischer gave the theoretical explanations for the deviations observed on ships between the radio bearing and the optical bearing. They recognized as underlying cause the effect of the secondary or interfering field caused by the ship and its superstructures. Because of its ability to determine bearings without any extra measures at the transmitting end the radio direction finder could assert itself in the following decases as a navigatory aid despite new methods of navigation. With the introduction of telephony on wavelengths between 100 and 200 m and at the distress frequency 2182 kc the interest in the radio direction finder has been given a fresh impetus with nonmilitary navigation for this frequency range as well. The navy is further interested in using the radio direction finder for short waves as well. Since improved components now enable the equipment designing engineer to make marine radio direction finding systems for all frequencies of interest, the need arises to explain also the direction-finding errors observed with waves from 200 to 100 m and with short waves. Unfortunately, the error equations of H. Maurer and F. Fischer are no longer useful in these bands, since certain assumptions on which their derivations are based hold for long waves indeed, but not at frequencies beyond 1.6 Mc. The objective of this paper is to derive, in the series presentation desired by the practical engineer, formulas for direction-finding error and minimum-flattening that hold for higher frequencies as well. The analysis shows that it is not advisable to consider the interfering field in component form, but that is more preferably described by two inversely rotating fields, because of the linear superimposition of the direction-finding errors and the minimum-flattening of both fields. If a conclusion as to the magnetic field at the antenna is desired from the observed direction-finding and minimum-flattening errors, the well-known Smith chart holds for these relationships. Quite generally the quasi-stationary field inside a goniometer or in the CRT of a visual direction finder can be considered as the cyclometric variant of the H-field and E-field, respectively, of a line. These considerations are followed by a statement of the azimuth dependence of fields with the principal interfering radiator arrangements. A generally stated formula gives the relationship between direction-finding error and minimum-flattening in an inplicit form with n arbitrary interfering radiators. For the principal special cases encountered in practice, this formula is so processed that the desired series statements are obtained. A circuit, that is largelv analog to the actual conditions, serves for the numerical evaluations. The results obtained with it are shown in numerous diagrams. A number of practical observations that have defied explanation so far could so be interpreted. Because of its length the paper must appear in three parts. This part I leads to the general error formula with n reflectors, part II deals with the individual interfering radiator, and part III with further combinations of interfering radiators. The conclusion contains a brief comment on newer papers related to this topic. (a_1-2, a_2-1, b-2, c-4, d-4, e-590, f-Part II dated November 1962; Part III December 1962. See Abstract Nos. 4747 and 4758)

4719. ANDREW, J. D., AND FONDE, D. S., "Application of Correlation Techniques to High Accuracy Position Location Finding," Space Technology Laboratories, Inc., Redondo Beach, California, Final Report, Volumes 1 and 2, Contract No. AF 30(602)2448, ASTIA Nos. AD-332 920 and AD-332 921; 1 August 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4720. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Progress in the Development of a Direct on Finding System Utilizing the 8-Loop Fixed Space Loop Antenna," Southwest Research Institute, Interim Report, Contract NObsr 85086; 1 August 1962. ABSTRACT: The development of a D/F system utilizing the 8-loop antenna (fixed spaced loop) is discussed. The feasibility of using this antenna with a goniometer or a twin channel technique has been previously reported. New results obtained with the 8-loop antenna and both the twin channel technique and the goniometer method are presented. An improved 8-loop goniometer system has been constructed to provide a laboratory breadboard to solve the basic engineering problems of the system. The receiver requirements for a goniometer scan D/F system are discussed in detail with comparisons of the R-390A, RA.17C and the AN/SRD-7. Other project work reported for the interim period includes phase stability measurements on the R-390A and RA.17C receivers. Detailed analysis of polarization response of spaced loop antennas is reported. Brief discussions of the status of the hybrid transformer and the DFG-4 UHF direction finder are given. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4692)

4721. BLEVINS, R. R., "Flight Test and Evaluation of OA-2097-(XN-1)/ALD-2 Electronic Countermeasures Antenna Detector Group," Naval Air Test Center, Patuxent River, Maryland, Interim Report No. 1, Serial No. WST41-0114, ASTIA No. AD-331 901; 13 August 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4722. ANONYMOUS, "Radio Location Techniques," Ohio State University, Research Foundation, Columbus, Ohio, Final Engineering Report, Contract No. AF 30(602)2214, ASTIA No. AD-333 957, 30 August 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4659)

4723. BRAVERMAN, N., AND MARCHAND, N., "Propagation-of-Error Equations for Airborne Doppler Navigation," Trans. IRE, vol. ANE-9, no. 3, pp. 134-140; September 1962. ABSTRACT: General equations for propagation of error with distance traveled for case of fix-correct Doppler navigation along path which consists of one or more rhumb-line legs are derived and shown to consist of combination of 6 types of error variances; specific expressions when position-finding system used for fix correction is either VORTAC or Loran type. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4724. CLIFFORD, V. H., COTTLER, S., AND KLEIN, R., "Direction Finder Set AN/CRD-12," ITT Federal Laboratories, Nutley, New Jersey, Final Report, Contract No. DA 36-039-sc-74839, ASTIA No. AD-400 114; September 1962. ABSTRACT: The design, construction, and testing of a direction finder set which employs the spinning antenna principle to obtain accurate, visually-presented bearings on airborne-transmitted communications signals appearing at the 225- to 400-mc range is reported. The set consists of an H-Adcock mast-supported antenna, a radio receiver, an azimuth indicator, a target transmitter, and a vehicular power supply, all of which are capable of being stowed in a vehicular communications installation. Mechanical and electrical problems encountered in the design development are discussed in detail. Test data and recommendations are included. (a-3, b-3, c-1, d-1, e-0, f-Descriptive project review)

4725. CLIFFORD, V. F., KLEIN, R., AND MILLAR, W., "Direction Finder Set AN/TRD-16," ITT Federal Laboratories, Nutley, New Jersey, Contract No. DA 36-039-sc-74986, Final Report; September 1962. ABSTRACT: This report covers the design, construction, and testing of a direction finder set which employs the spinning antenna principle to obtain instantaneous-visual bearings on vertically, horizontally, and cross-polarized signals appearing in 30- to 230-mc frequency range. The set consists of a mast-supported antenna and an operating equipment console which are capable of being stowed in a transportable shelter. (a-1, b-3, c-1, d-1, e-0, f-Project summary)

4726. SHERWIN, S. A., AND MILLER, R. T., "The Impact of Electronics on Warship Ship Design," Society of Naval Architects and Marine Engineers, no. 9, p. 1; September 1962. ABSTRACT: Representing only a minor portion of the ship space and weight requirements and ship construction costs two decades ago, ship electronic systems and the sophisticated weapons systems they support account for major space and weight requirements and as much as 44 percent of naval ship construction costs. The growth of ship electronic systems from simple radio-communications equipment prior to World War II to complex communications networks, search, track, fire-control and missile-control radars, sonars, computers, and control equipment is traced. Ship growth as a price of increased operational effectiveness was a historic fact long before electronic systems became a controlling cause. However, the increasing cost of warships is now a matter of grave concern. If we are to meet our naval commitments for the national defense, solutions to the size and cost problem must be found. To this end the Navy is attempting to treat all of the electronics and related systems in order to reduce unnecessary redundancies. Other techniques such as greater standarization of components and circuits, utilization of microelectronic technology, and automation are being considered to reduce maintenance and training problems, increase reliability, and reduce manning. Hopefully, real gains will be made during the next few years in treating naval ship design as complete weapon system design. (a-1, b-1, c-1, d-1, e-0, f-Survey)

4727. ARBEL, E., AND FELSEN, L. B., "Radiation from a Dipole in an Infinite, Homogeneous, Anistropic Plasma," Microwave Research Institute, Polytechnic Institute of Brooklyn, New York, Research Report No. PIBMRI-1070 62, ASTIA No. AD-415 388; 25 September 1962. ABSTRACT: A previously derived solution is specialized here to the study of the radiation field due to an electric current dipole in an infinitely extended, homogeneous anisotropic plasma. The asymptotic field solution is interpreted in terms of rays along which energy propagates from the source to the observation point. The number of contributing rays, varying from zero to four, depends on the constitutive parameters and is determined by the refractive index curves for the medium. Special attention is given to transition phenomena asso-

ciated with refractive index curves which have points of inflection or unbounded branches. A set of representative radiation patterns has been calculated. (a-1, b-3, c-1, d-1, e-0, f-Study report)

4728 BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratories, Report No. 13, Contract No. DA 36-039-sc-87264, Quarterly Report No. 5, ASTIA No. AD-292 667; 30 September 1962. ABSTRACT: The purpose of this research is to design a radio direction finding system for the MF-HF-VHF range. Studies and investigations were performed on (1) propagation research, (2) RDF system engineering, (3) data handling and presentation, and (4) data analysis, interpretation, evaluation. These tasks continue unchanged although the parts have been now restricted to the more promising approaches. (a-1, b-3, c-1, d-1, e-501, f-Progress report. See Abstract No. 4702)

4729. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Progress in the Development of a Direction Finding System Utilizing the 8-Loop Fixed Spaced Loop Antenna," Southwest Research Institute, Final Development Report, Contract NObsr 85086; 30 September 1962. ABSTRACT: Progress in the development of an 8-loop (crossed spaced loops) direction finder for shipboard use is outlined. Experimental operation of a sense antenna from 2 to 30 mc without sense reversal is reported. Methods are outlined for the optimization of signal transmission efficiency through the D/F system. Data are given on the bearing sensitivity of the twin channel and single channel goniometer D/F systems. It is concluded that a need exists for a low noise preamplifier to achieve efficient use of the available 8-loop antenna signal. An amplifier currently under investigation is described. A summary is given of other project activities including the modification of the Southwest Research Institute D/F tower, the design of a through-mast D/F antenna and the current status of planned shipboard tests of the Servo Corporation DFG-4 UHF direction finder, and the AN/SRD-7 spinning spaced loop (3-loop). (a-1, b-3, c-1, d-1, e-1000, f-Final summarizing report. See Abstract No. 4710)

4730. GALEJS, J., "Dielectric Loading of Electric Dipole Antennas," J. Res. Nat. Bur. Stand., vol. 66D, no. 5, p. 557; September-October 1962. ABSTRACT: It has been indicated by Wheeler that dielectric loading ($\epsilon > 1$) decreases the radiation power factor of small capacitor type antennas. A wide-angle biconical antenna is shown to follow this behavior. However, exceptions to it are provided by an infinitesimal dipole embedded in a finite dielectric sphere and by dielectrically loaded small-angle biconical antennas, where a moderate increase of ϵ provides a slight increase of the radiation power factor. In the latter two cases the dielectric surface is not tangential to the electric field lines and the reasoning which leads to the results of Wheeler is not strictly applicable. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4731. HUFFMAN, D. L., "Short Pulse-Fresnel Radiation Patterns of Traveling-Wave Antennas," 12th Annual Symposium on USAF Antenna Research and Development Program, University of Illinois, Urbana, Illinois, Sponsored by Wright-Patterson AFB, Ohio; October 1962. ABSTRACT: Traveling-Wave Antennas are a class of antenna structures that are prominently considered in applications to radar and communications. Such structures have application because of certain features of design simplicity: Impedance matching (end feeding) and aperture illumination (amplitude and phase) can be more easily controlled by this technique than by the use of other techniques. Alternative approaches would consider the use of a corporate feed structure, with separated radiating elements. Traveling-Wave Antennas receive consideration in the design of Incoherent Side-Looking Radars; and this paper is concerned with the inherent limitation of their use in Side-Looking Radars. There are two fundamental limitations when application is considered. The limitations are the short pulse effect and the defocussing effect (resulting from Fresnel Radiation). Short Radar Pulses, and Long End-Fed Linear Antenna Arrays are employed for the purpose of producing high range and angular resolution. The conventional consideration in the design of antenna arrays is the selection of the required aperture distribution of energy that will yield desirable values for CW Far Field Gain in relationship to low side lobe levels. However, transient radiating fields that exist during the times of incomplete antenna excitation, will have a perturbing effect on the contemplated radiation pattern, if the antenna excitation time is an appreciable percentage of the pulse duration time. If Short Radar Pulses and Long End-Fed Arrays are employed, then this condition is produced. In addition, Side-Looking Radars often contain ground mapping modes of operation which lie at ranges in the Fresnel field of the antenna. (a-1, b-3, c-1, d-1, e-0, f-Descriptive analysis)

4732. ISLAM, M. A., "Analysis of an Electrically and Magnetically Loaded Loop Antenna," 12th Annual Symposium on USAF Antenna Research and Development Program, University of Illinois, Urbana, Illinois, Sponsored by Wright-Patterson AFB, Ohio; October 1962. ABSTRACT: This paper is an outcome of the author's investigation of low-frequency magnetic antennas and of whether or not a permeable core (a ferrite core, for example) can improve the performance of such an antenna. As a natural consequence of the inquiry, the first problem to be solved was that of solving Maxwell's equations with prescribed boundary conditions. For this, one could use the electric-field and magnetic-field quantities, or use suitably-defined vector and scalar potentials. The second method was chosen in the present case. Only rationalized MKS units have been used throughout this paper. The method involves the solution of the homogeneous wave equation with the harmonic time variation in terms of a complete set of harmonic functions with unknown coefficients. Then, proper boundary conditions are imposed on this set of solutions to determine the unknown coefficients. Among the various possible configurations, a cylindrical material core, excited by a loop of current, might be of particular practical interest. While the prolate spheroid represents the nearest approximation to a cylindrical core of finite length realizable with orthogonal coordinate surfaces, we will discuss in this paper the mathematically simpler case of an infinite cylindrical core and indicate how the method can be extended to the prolate spheroid. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4733. PRIEDIKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Quarterly Progress Report No. 8, Contract No. DA 36-039-sc-84966, ASTIA No. AD-335 774; October 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4709)

4734. REMMLER, O. D., "Bibliography on Direction Finding and Related Ionospheric Propagation Topics, 1955-1961," National Bureau of Standards, Technical Note No. 127; October 1962. ABSTRACT: This bibliography is an outgrowth of a conference held at the University of California at Los Angeles in June 1960 to discuss the aspects of long-range high-frequency radio propagation that affect radio location and direction finding, and the related problems of measurement and analysis. A group of the papers presented at the conference was published in the Radio Propagation Section (Section D) of the Journal of Research of the National Bureau of Standards, May-June issue, 1961. In connection with the conference the Numerical Analysis Research Staff of UCLA prepared a bibliography of published work on the conference subject covering the period 1955-1959. For this Technical Note the UCLA bibliography has been edited and extended to include some papers published in 1960 and the first half of 1961. This compilation, though by no means exhaustive, includes over 850 titles on direction finding and related topics ranging from instrumental details through observations and data analysis to theories of propagation. (a-1, b-3, c-1, d-1, e-595, f-Bibliography)

4735 SHARP, E. D., "The Ramp Feed for the Wire-Grid Lens Antenna," Thompson Ramo Woolridge, TAPCO Division, Inglewood, California, Report No. RADC TDR 62-559, ASTIA No. AD-299 359; October 1962. ABSTRACT: Radiation patterns using this method of feed show constant azimuth beamwidth. (a-3, b-3, c-1, d-1, e-0, f-0)

4736. SIDDIQUI, M M., "Some Statistical Theory for the Analysis of Radio Propagation Data," J. Res. Nat. Bur. Stand., vol. 66D, no. 5, p. 571; September-December 1962. ABSTRACT: The statistical theory of stationary processes has wide applications in the analysis of radio wave propagation data. In this paper, assuming the knowledge of the basic concepts of probability theory on the part of the reader, characteristics of stationary processes such as covariance and spectral density functions have been developed, problems of estimating these characteristics have been tackled, and numerous examples have been worked out to illustrate the theory. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4737. SUESSKIND, C., "Popov and the Beginnings of Radiotelegraphy," Proc. IRE, vol. 50, no. 10, p. 2036; October 1962. ABSTRACT: Popov's role in the development of radiotelegraphy is evaluated in relation to the contributions of other pioneers, notably Lodge and Marconi. The official Soviet position on the matter is critically reviewed. Since 1945, Soviet authorities have vociferously claimed the title of "inventor of radio" for Aleksandr Stepanovich Popov (1859-1905), bringing forward a great deal of historical evidence to support their claim. The task of critically examining that evidence has long been incumbent upon non-Soviet historians of technology, but has been hitherto tackled only in a very patchy way. The present contribution is the result of a careful study of the original Russian sources and other pertinent technical literature of the period, an examination of most of the material published in the Soviet Union afterwards, and an evalua-

tion of some of the comments that the controversy has elicited in other countries. The author approached his task with an entirely open mind and drew his conclusions not in any effort to discredit Popov (who was one of the pioneers in the art of adapting Hertz's experiments to practical applications), but rather with a view to presenting an impartial account, free from the strongly partisan attitude characteristic of the material published on Popov by his fellow countrymen. During the first five or six years after Hertz had proved the validity of Maxwell's wave theory of electromagnetism by a series of brilliant experiments published in 1888-1889, they were carried further and elaborated by a number of physicists. Ramsey has shown that although many of these experiments were remarkably advanced for their time, they did little to bring technological application nearer. Most could be, in fact, classified under a heading that did not come into its own until half a century later: microwave optics. Typical of this group of investigations were those of Edouard Sarasin (1843-1917) and Lucien de La Rive (1834-1924) at Geneva, Antonio Giorgio Garbasso (1871-1933) and Emil Aschkinass (1873-1909) at Berlin,Jagadis Chunder Bose (1858-1937) at Calcutta, and Augusto Righi (1850-1920) at Bologna. The last had probably the most direct influence on the technological development of the subject, not only because it led to a second textbook (devoted entirely to radiotelegraphy), but also because it was at Righi's lectures that young Guglielmo Marconi (1874-1937) received the first proper grounding in the field that was to make him famous. But the single event that proved to be the most important technologically occurred in London on June 1, 1894, five months after the tragically premature death of Hertz at the age of 36. In commenoration, Oliver Joseph Lodge (1851-1940) gave a demonstration lecture at the Royal Institution that was to have far-reached consequences. (a-1, b-1, c-1, d-1, e-0, f-Historical review)

4738. WAIT, J. R., "Possible Influence of the Ionosphere on the Impedance of a Ground-Based Antenna," J. Res. Nat. Bur. Stand., vol. 66D, no. 5, p. 563; September-October 1962. ABSTRACT: The analysis for the inpedance of a vertical electric dipole in the presence of an isotropic and homogeneous conducting half-space is presented. Various approaches to the problem are then briefly compared and some numerical results are presented in graphical form. The extensions to an anisotropic half-space are also considered. Finally, the dipole is located in the space between a homogeneous ground and a sharply bounded ionosphere. It is concluded that the presence of the ionosphere has a negligible effect on the impedance of a ground-based antenna unless the frequency is less than 1,000 c/s or so. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4739. WELCH, G., "A High Performance, Lightweight Luneberg Lens," 12th Annual Symposium on USAF Antenna Research and Development Program, University of Illinois, Urbana, Illinois, Sponsored by Wright-Patterson AFB, Ohio; October 1962. ABSTRACT: The Luneberg Lens is a variable index, spherically symmetrical structure which will collimate electromagnetic energy. The energy will be focused at a point diametrically opposite the tangency of an impinging plane wave. To make a spherical lens capable of focusing electromagnetic waves at a given point or at least within a very small area, the refractive index, N, of the dielectric must vary in a precise prescribed manner. The relation between refraction index and radial distance from the center of the sphere for the case where the focal point is on the periphery is shown in the Standard Luneberg Equation. (a-1, b-3, c-1, d-1, e-0, f-Description)

4740. ZISLER, S., "Type GA 502 UHF Automatic Direction Finding System," Ann. Radioelect., vol. 17, no. 70, pp. 339-349; October 1962. ABSTRACT NO. 1: Type GA 502 UHF automatic direction finding system; small size system for 225 to 400 Mc band provided with subsystem for reducing errors caused by stray reflections near antenna; system operates over whole frequency band without retuning; overall accuracy is plus or minus 3° for elevations less than 45°. ABSTRACT NO. 2: The D/F system described uses a cylindrical dipole with three reflectors at 120° around it. Two of these are in the form of cylindrical dipoles and the third is a rod dipole. The radiation pattern is roughly triangular, with rounded apices and with sides concave outwards. The received signal is thereby modulated with components which are functions of α and 3α, α being the angular rotation with respect to the direction of incidence. These components are filtered into two channels and are used to produce rectangular pulses. A third pulse is derived from a 10 kc/s sweep oscillator, which, with a selsyn, provides the deflecting voltages for a crt, the electron beam of which is cut off except when pulses from the three channels are superimposed. This occurs when the aerial is aligned with the signal. The aerial operates over the band from 225 Mc/s to 400 Mc/s, and the system is insensitive to a horizontally polarized component of the electric field. For all elevations less than 45° the maximum error is ±3°. (a_1-3, a_2-3, b-1, c-3, d-3, e-0, f-Description)

4741. BAUER, R. J., AND TANDERSLEY, J. C., "Strip Line Dual Channel Receiver," IRE, East Coast Conference on Aerospace and Navigational Electronics - Tech Paper 5.1.4 for meeting 22-24 October 1962. ABSTRACT: UHF dual channel strip transmission line receiver front-end is described which forms part of precision tropo scatter direction finding system; receiver front-end consists of strip line high-level modulator with 2 single sideband outputs and 2 low noise figure strip line balanced mixers. (a-1, b-1, c-1, d-1, e-0, f-Description)

4742. KAISER, J. A., SMITH, H. B., PEPPER, W. H., AND LITTLE, J. H., "Passive Automatic Direction Finder," IRE, East Coast Conference of Aerospace and Navigational Electronics - Tech Paper 3.2.3 for meeting 22-24 October 1962. ABSTRACT: Automatic direction finder with no moving parts and no directional ambiguities over hemisphere is described; system consists of spiral antenna operating in first two radiation modes simultaneously, microwave phase comparator, and suitable display unit; spherical coordinate angle is uniquely determined instantaneously from phase measurement, and elevation angl is determined from amplitude comparison. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

4743. COOPER, R. E., MARTIN, P. E., SHERRILL, W. M., AND TRAVERS, D. N., "Eighth Interim Report: The Beverage Direction Finder. Interim Development Report for a Study Technique to Produce a High Frequency Land Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, Contract NCbsr 85364; 26 October 1962. ABSTRACT: Construction of minimum land area circular array of 300 meter long antennas is now complete. Extensive electrical measurements are currently being made on this array. Construction of the 180 section diode switch commutator display system is underway. Construction should be essentially complete by early December. A computer program has been written which considers signal elevation angles and can calculate resulting patterns for combinations of up to six antennas in phase and amplitude matched configurations. Results will be presented in a future report. The original 360° array of 120 meter long antennas has been converted from 36 antennas spaced 10 degrees apart in azimuth, to an array of 180 antennas spaced 2 degrees apart. Construction is now complete except for lead-in cables and matching transformers which are currently being installed. (a-1, b-3, c-1, d-1, e-1000, f-See Abstract No. 4693)

4744. EVANS, G., "The Cross-Spaced-Loop Direction Finder Aerial," Trans. IRE, vol. AP-10, no. 6, pp. 686-691; November 1962. ABSTRACT: A fixed array of four loop aerials is described which, in conjunction with a goniometer, is equivalent to a rotating spaced-loop aerial when receiving ground wave signals. Experimental verification of this performance is given. The theoretical performance of this system when receiving sky wave signals is developed. Under these conditions, the system offers no advantage over the simple cross-looped aerial. (a-1, b-1, c-1, d-1, e-0, f-Description)

4745. MARTIN, P. E., AND STRAITON, A. W., "Earth Probe Antennas," Ground Support Equipment (GSE); October-November 1962. ABSTRACT: The use of earth probes as antennas for VLF reception may seem a paradox because of the vertically polarized nature of the transmissions. However, experimental comparisons of an earth probe antenna with two overhead wire systems indicate that the earth probe system may be successfully used for detection of stations in the 10 to 20 kc range with signal-to-noise ratios superior to those of the overhead systems. Background sferic radiation from 50 cps to 20 kcps also appears on the earth probes, but with some reduction of man-made interference, such as 60 cps from power lines. To determine earth probe antenna characteristics, electodes were placed in the earth at The University of Texas Balcones Research Center near Austin, Texas. Excellent ground contact was maintained by use of a slightly porous container in which a cadmium electrode was immersed in a cadmium chloride solution. The electrodes were placed 1100 feet apart in a north-south alignment. RG62/U coaxial cable was buried a few inches along a line between the probes with the center conductors used as lead-in wires from the probes to a differential preamplifier at the mid-point. (a-1, b-2, c-1, d-1, e-0, f-Description)

4746. SMITH, W. E., "Estimation of Variances for Radio Direction Finding Equipment," University of California, L.A., Numerical Analysis Research Department Technical Report, Contract No. Nonr-23376, ASTIA No. AD-289 663; November 1962. ABSTRACT: The problem in the use of radio direction finding techniques of estimating the variances of the readings obtained from the different receivers is investigated. These variances are used to perform a least squares estimate for the most probable point for the transmitter. One may not know the true

position of any transmitter and, therefore, cannot obtain an estimate of the variance of a sin e receiver. By taking several receivers an estimate is made of the transmitter position and using this information, an estimate is made of the accuracy of the various receivers. A specific model was described which was simulated on a high-speed computer. The theory, computations to be performed, and results are described. The method is able to distinguish between good and poor receivers and in many cases gives excellent approximations to the variances. (a-1, b-3, c-1, d-1, e-614, f-Analysis)

4747. ZIEHM, G., "Fundamentals of a General Theory of Direction-Finding Error Aboard Ships, Part II," Frequenz, vol. 16, no. 11, p. 431; November 1962. ABSTRACT: See Abstract No. 4718. (a-4, b-2, c-4, d-4, e-590, f-Principles shipboard RDF)

4748. ANONYMOUS, "Bulletin of the Crimean Astro-Physical Observatory (Selected Articles)," Wright-Patterson AFB, Ohio, Foreign Technology Division, Report No. TT 62-587, ASTIA No. AD-284 137; December 1962. ABSTRACT: The registration of the intensity of atmospherics on 27 Kcs with a directional antenna system, and the possible structure of the D-Region during sudden ionospheric disturbances. (a-3, b-3, c-1, d-1, e-0, f-Study report)

4749. BALSER, M., AND SMITH, W. B., "Some Statistical Properties of Pulsed Oblique HF Ionospheric Transmissions," J. Res. Nat. Bur. Stand., vol. 66D, no. 6, p. 721; November-December 1962. ABSTRACT: A study is made of the amplitude fading of 35-μsec HF pulses transmitted via the ionosphere over a 1,566-km path between Atlanta, Ga., and Ipswich, Mass. The distribution functions for about half of the records taken fit the family of distributions for a sine wave in Gaussian noise, with most of these best fitting the curve for pure noise (the Rayleigh distribution). Some examples of two sine waves with random phase are observed. It is concluded that most of the remaining curves which do not fit these distributions correspond to samples of nonstationary functions. The median fading time for one-hop paths is of the order of 20 seconds, and many examples occur with considerably longer fading times. Multiple-hop paths give fading times of a very few seconds. Space correlation distances are also considerably greater than expected, averaging around 40 wavelengths, which correspond to a mean angular deviation of the order of two tenths of a degree. Many crosscorrelation functions show peaks displaced in time from the origin, reflecting the effect of ionospheric winds. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

4750. FREEMAN, J. J., "Range-Error Compensation for a Troposphere with Exponentially Varying Refractivity," J. Res. Nat. Bur. Stand., vol. 66D, no. 6, pp. 695-697; November-December 1962. ABSTRACT: An explicit formula for tropospheric range error is derived for a troposphere with a spherically symmetric refractivity which varies exponentially with height. The correction is given as function of surface refractivity and ray elevation angle, and its accuracy and limitations are discussed. (a-3, b-1, c-1, d-1, e-0, f-Mathematical analysis)

4751. JOHLER, J. R., AND BERRY, L. A., "Propagation of Terrestrial Radio Waves of Long Wavelength - Theory of Zonal Harmonics with Improved Summation Techniques," J. Res. Nat. Bur. Stand., vol. 66D, no. 6, p. 737; November-December 1962. ABSTRACT: The rigorous mathematical treatment for the propagation of a radio wave from a Hertz-dipole-source current-moment around a finitely conducting spherical earth surrounded by a concentric electron-ion plasma can be expressed as a series of zonal harmonics. Such a solution to the problem was obtained for the terrestrial sphere without a concentric plasma many years ago (1904-1915). However, the summation of the series, even at long wavelengths or low frequencies, was considered to be impractical and the well-known and, indeed, rigorous Watson transformation was introduced (1918). The Watson transformation led to the development of elegant mathematical techniques both rigorous and approximate for the evaluation of the fields of radio waves in the vicinity of the earth. However, it does not necessarily follow that the Watson transformation is the only way to achieve numerical mastery of the problem. Indeed, it also does not follow that the Watson transformation is the most efficient approach to the rigorous form of the theory of propagation, especially at long wavelengths. This paper demonstrates that the field of the propagated long wavelength radio wave (frequencies less than approximately 50 kc/s) can indeed be evaluated by a summation of a series of zonal harmonics. Whereas the number of terms could become quite large (of the order of 19 k_1a where a is the radius of the sphere and k_1 is the wave number of the medium between the concentric plasma and the earth), the speed with which these terms can be summed on a large-scale computer offsets the complications introduced by the Watson transformation as to the rigorous mathematical solution of the problem. The detailed structure of the field in the absence of a concentric plasma is characterized by the quite regular behavior of the ground wave as a function of distance. Indeed, the steady decrement of the ground-wave field is modified only near the antipode, where an interference pattern or standing wave as a function of distance is noted because of another wave's traveling around the sphere in the opposite direction. The introduction of the concentric electron-ion plasma shell traps the waves leaking into space, where reflection from the plasma builds up traveling waves in the direction of increased distance from the transmitter. Thus, the series of zonal harmonics comprises individual waves which are traveling in the radial direction with respect to the center of the sphere and standing in the direction of increased angular distance around the sphere. These waves, when summed, build up the wave progressing in the direction of increased angular distance. Under special circumstances, standing waves can be noted. This is especially obvious near the antipode of the transmitter. The results of the computations indicate that full rigor can be achieved with comparative ease at frequencies less than approximately 50 kc/s, leaving only the assumed model for the transmitter and the propagation medium and avoiding the complications of the Watson transformation. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4752. MARTIN, E. J., JR., "A Note on the Radiation Resistance and Field Strength of a Large Loop Antenna," Proc. IRE, vol. 50, no. 12, pp. 2507-2508; December 1962. ABSTRACT: Notes the general expression for the far-field vector potential. (a-2, b-1, c-1, d-1, e-0, f-Theory)

4753. MIWA, S., NAKAJIMA, A., HANAI, Y., AND MIMATSU, A., "The Doppler Direction Finder," J. Inst. Elect. Commun. Engrs. Japan, vol. 45, no. 12, pp. 1637-1645; December 1962. ABSTRACT: To reduce bearing errors in direction finders resulting from the existence of electrical reflectors, it is effective to increase the diameter of the aerial array in comparison with the wavelength of the received signal. In a Doppler direction finder of the portable type, the diameter of the array is limited by the operating conditions. Experiments with a specially designed Doppler D/F are described and the relation between the number of aerials used and the upper limit of the frequency of the received signal is shown graphically. The bearing errors in the Doppler D/F and in an Adcock D/F due to an electrical reflector purposely introduced, were measured for frequencies ranging from 4 to 18 Mc/s, the results being shown in a set of curves for the azimuth range 0.360°. (a-3, b-1, c-6, d-6, e-0, f-Description and analysis)

4754. SCHULZ, W., "A Horn Radiator with Heavily Suppressed Side-Lobes for use as Transmitting Aerial of Radio Direction Finding Equipment," Nachrichtentech. Z., vol. 15, no. 12, pp. 635-638; December 1962. ABSTRACT: In order to satisfy the stringent requirements imposed on CW-D/F equipment with respect to cross-talk and sidelobe suppression, screening tests have been carried out mainly on a horn radiator using home-made multilayer absorbing material. 123 db aerial cross-talk attenuation is a certain technical limit for a predetermined main axis spacing of 15λ. It will hardly be possible to exceed this value without application of a λ/2 compensation. (a-3, b-2, c-4, d-4, e-0, f-Descriptive analysis)

4755. SEELEY, E. W., "Optimum Wave Antenna Reception Patterns at Very Low Frequencies," Naval Ordnance Laboratory, Corona, California, NOLC Report 574; December 1962. ABSTRACT: The theoretical reception-pattern characteristics of the wave antenna at VLF, and an experimental study of the parameters that determine the pattern are presented. Wave antennas have optimum lengths at which the front-lobe-to-back-lobe ratios are greatest. Only the first optimum length (highest front-lobe-to-back-lobe ratio for the shortest length) is considered in this report. The patterns of the wave antenna at these optimum lengths depend upon only two parameters, which can easily be measured at the desired locations. These parameters are the antenna loss and the wave velocity along the antenna. When the values of these parameters are known, the patterns of all first-optimum-length wave antennas can be drawn from the curves presented in this report. (a-1, b-3, c-1, d-1, e-607, f-Experimental study and analysis)

4756. SWIFT, D. W., "Very-Low-Frequency Radio Propagation in the Ionosphere," J. Res. Nat. Bur. Stand., vol. 66D, no. 6, p. 663; November-December 1962. ABSTRACT: Equations describing the propagation of radio waves in a horizontally stratified anisotropic ionosphere were developed by considering the limiting case of a large number of infinitesimally thin slabs of constant electron density and collision frequency. The quasi-longitudinal approximation was used. The propagation equations appeared as four coupled first-order linear differential equations, coupled by gradients in electron density and collision fre-

quency. The quasi-longitudinal approximation permitted use of particularly simple forms for the coupling coefficients, these forms being amenable to simple analysis. Coupling between two ordinary or two extraordinary modes was found to be considerably stronger than cross coupling between ordinary and extraordinary modes. Cross coupling was related to the rate of change of the direction of the phase normal. It was found that the reflection of VLF radio waves from the daytime ionosphere is relatively insensitive to the angle of incidence on the ionosphere except for highly oblique propagation. Whistler penetration was also found to be insensitive to the angle of incidence on the ionosphere. (a-1, b-1, c-1, d-1, e-0, f-Propagation theory)

4757. WU, T. T., "Theory of the Thin Circular Loop Antenna," Journal Math. Phys., vol. 3, no. 6; November-December 1962. ABSTRACT: The current distribution on a thin circular loop transmitting antenna driven by a delta-function generator is determined approximately by Fourier series expansion. A difficulty encountered in previous analysis is shown to be due to an inadequate approximation. (a-5, b-1, c-1, d-1, e-0, f-Theory)

4758. ZIEHM, G., "Fundamentals of a General Theory of the Direction-Finding Error on Ships. III," Frequenz, vol. 16, no. 12, pp. 502-510, December 1962. ABSTRACT: Fundamental relations are established between the observed disturbing effects in a ship's direction finder and the characteristics of the source of interference. Methods for eliminating such interference are not generally treated, but the results of calculations indicate that in certain simple cases, elimination of a ships' direction-finding error may be possible. (a-2, b-2, c-4, d-4, e-590, f-See Abstract Nos. 4718 and 4747 for Parts I and II)

4759. GAGNON, M. K., AND GAGNON, C. R., "Bearing-Only Zig Detection," General Dynamics Corporation, Electric Boat Division, Report No. C417-62-042, Contract NOnr-251200, ASTIA No. AD-335 718. See also ASTIA No. AD-336 592; 20 December 1962. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4760. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Urbana, Illinois, Electrical Engineering Research Laboratories, Quarterly Report No. 6, Contract DA 36-039-sc-87264, ASTIA No. AD-404 022; 31 December 1962. ABSTRACT: Efforts were continued on the design of a radio direction finder system for the MF-HF-VHF range. An MF-HF radio direction finder of the phase comparison type using wide aperture antenna arrays was instrumented and put into operation as a principal research tool for radio location studies on 5155 and 5345 kc transmissions from Columbus, Ohio. Data from a local vertical incidence ionosonde was used to predict the measured vertical incidence angle of arrival. The predicted angle of arrival agrees to within one-degree of the angle measured by two interferometers in a set of three. Further improvements in the RDF system are indicated. However, the system is approaching the limitations set by the ionosphere. (a-1, b-3, c-1, d-1, e-508, f-Progress report. See Abstract No. 4728)

4761. SMITH, R. S., "Electronic Observers for Radio Direction Finding," University of Illinois, Thesis, ASTIA No. AD-613 039; ca 31 December 1962. ABSTRACT: The purpose of this study is to examine the feasibility of electronic observers in radio direction finding. In particular, automated bearing readout methods are investigated for the Wullenweber wide-aperture radio direction finder installed at the University of Illinois, with particular attention to the effects of amplitude modulation on bearing readout. An examination of a generalized RDF system is given to show the potential effects of the various components on bearing readout accuracy, and the state-of-the-art in RDF systems and readout methods is reviewed. The system to be used for this study, the Wullenweber wide aperture set, is described in detail, noting the pertinent characteristics for this study. Some statistical characteristics involved in readout problems are discussed and the three basic requirements for the application of Wiener's work in time series are noted, along with the nature of the output ensemble from the D/F receiver. Tchebysheff's inequality is applied to the prediction of sample size requirements, and some sampling rate considerations are noted in the light of the predicted sample sizes. A computer routine was written to compare the accuracies and speeds of three methods of computing bearings from the output of the D/F set. It was found that in almost all cases the center of gravity of the data points gives the most accurate bearing determination, with the axis of a (sin x)/x curve fitted to the set of data points giving results almost as good. A method based on generating a polynomial passing through all data points, with bearings determined by differentiating the resulting function to find the point(s) of zero slope, gave very poor results on all but the smoothest data sets. Under simulated heavy amplitude modulation, the polynomial determination sometimes gave multiple, i.e., ambiguous, answers. An operational test routine for the computer was written based on the results of the calculation test routine. This test computes a series of bearings from the centers of gravity of the data sets associated with each goniometer revolution and also averages all the data for smoothing purposes. The mean and standard deviation of the series of centers of gravity is compared to the bearing and a pseudo-beam-width obtained by fitting a (sin x)/x curve to the smoothed data. Four data runs were made on WWV at 10 Mc. under conditions of no modulation, 600 cycle tone modulation, pulse train, and 440 cycle tone modution, and these runs were analyzed by the operational test routine. All modulated runs show spreading of the bearings resulting from the beat note between the modulation and the sampling rate of the goniometer, and the time distribution of the bearing sequences shows correlation with the beat note. In the case of the 600 cycle modulation, this effect produced a separate set of normally distributed bearings displaced by about 4.5 degrees from the true bearing. When operating on live data, the (sin x)/x curve fit is shown to give bearings no better than the center of gravity method, and the "beamwidth" measure of bearing spreading taken from the curve fit can be badly distorted by poor bearing distributions. A discussion of data handling characteristics applied to RDF systems is given, and the conclusions reached are applied to the design and construction of an extensive automatic data handling system. Several suggestions for elimination of the deleterious effects of signal modulation on bearing readout are made, and some direction for the next steps in the research program is given. (a-1, b-8, c-1, d-1, e-840, f-Thesis for degree of Doctor of Philosophy)

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4762. ANONYMOUS, "Proceedings of the First Annual Symposium of Unconventional Inertial Sensors, December 10, 11, 1962, Farmingdale, L.I., New York, Under the CoSponsorship of Bureau of Naval Weapons and Republic Aviation Corporation in Cooperation with the Air Force Systems Command," Republic Aviation Corporation, Farmingdale, New York, ASTIA No. AD-336 835; 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Symposium report)

4763. BODMER, M. H., "Design of Aerials for Navigation and Location," Tijdschrift Ned. Elektronica Radiogenoot., vol. 28, no. 1-2, pp. 29-39; 1963. ABSTRACT: The characteristics of aerials in general are described. The radiation patterns of a rectangular aperture are given for various field distributions across the aperture. A short descriptive treatment is given of horn aerials, lens aerials dielectric aerials, slot aerials and parabolic reflectors. Mechanical tolerances of parabolic aerials and Cassegrain reflectors are also discussed. It is shown that a parabolic reflector should maintain its parabolic shape to within $\lambda/16$ if the phase error is not to exceed 45°. (a-3, b-2, c-12, d-12, e-0, f-Description)

4764. COCHRAN, W. W., AND HAGEN, T. E., "Construction of Collar Transmitters for Deer," Minnesota Museum Nat. Hist. Tech. Report No. 4; 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Biotelemetry)

4765. D'ANGELO, F., CALLAHAN, J. F., SAVASTA, R. T., AND MALAGISI, C. S., "Log Periodic Antenna Scanning Arrays," IEEE Int. Convention Rec., vol. 11, Pt. 1, pp. 109-117; 1963. ABSTRACT: Broadband array of log periodic elements that is capable of achieving small beamwidth at higher end of frequency band and minimum beamwidth change over many octaves; scanning of array beam through angles of order of few beamwidths was obtained without appreciable pattern deterioration; actual phase distribution for forward and scanned beam positions at various frequencies agrees well with prediction of analysis. (a-3, b-1, c-1, d-1, e-0, f-Study and investigation)

4766. HEISLER, L. H., "Observation of Movement of Perturbations in the F-Region," J. atmos. terrest. Phys., vol. 25; 1963. ABSTRACT: A summary is given of investigations into the phenomenon of travelling ionospheric disturbances in the F-region made at the Radio Research Laboratories, University of Sydney, Australia. The results of these investigations are compared with those made by other methods, and on a statistical basis measured speeds and directions do not agree. Possible explanations are given for this discrepancy. It is suggested that many general conclusions on F-region drift are drawn from selective data and that a whole range of different size perturbations exist in the ionospheric medium, the size and speed and direction of movement depending on the particular observational technique chosen. It is proposed that the MITRA method in particular is not entirely satisfactory for investigating F-region movement and should be supplemented by other techniques. (a-1, b-1, c-1, d-5, e-0, f-Study and investigation)

4767. ISHIMARU, A., AND LAHTI, J. N., "Unequally Spaced Arrays Fed from Traveling Wave Sources," WESCON Tech Papers, vol. 7, Pt. 1, no. 10.2, 1963. ABSTRACT: Method for synthesizing desired radiation pattern by means of unequally spaced array which is fed from traveling wave source; problem includes relation of desired radiation pattern to current and position of each element in array, and physical realization of array when fed from traveling wave source. (a-3, b-1, c-1, d-1, e-0, f-Descriptive analysis)

4768. NISHIDA, S., AND KUGO, K., "Coupled Slot Antenna," Rep. Res. Inst. Elect. Commun., Tohoku University, vol. 15, no. 2, pp. 93-108; 1963. ABSTRACT: The impedance properties of mutual coupling between two parallel slots located in an infinite plane are derived theoretically for the rectangular waveguide-end-slot aerial. Numerical calculations of them are presented in graphical form as the function of spacing between two slots and compared with the experimental results. (a-3, b-1, c-6, d-6, e-0, f-Theory)

4769. NELSON, E. M., ET AL., "The Model D-11 Direction Finding Receiver," Minnesota Museum Nat. Hist. Tech Report No. 2; 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Biotelemetry)

4770. BARTON, B. F., AND FARRIS, H. W., "Countermeasures Research," Cooley Electronics Laboratories, University of Michigan, Ann Arbor, Michigan, Quarterly Progress Report No. 4, Contract DA 36-039-sc-89227, ASTIA No. AD-335 776; January 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4771. COCHRAN, W. W., AND LORD, R. D., "A Radio Tracking System for Wild Animals," J. Wildl. Mgmt., vol. 27, no. 1, p. 9; January 1963. ABSTRACT: This system of radio location has been used on rabbits (Sylvilagus floridanus), stripped skunks (Mephitis mephitis), and raccoons (Procyon lotor). Size, weight, life, physical and electrical stability, and radiated power are important parameters of the transmitter. Mercury cells provide about 115 milliwatt hours per gram and were chosen as the transmitter power source. The transmitter is a transistor, crystal-controlled oscillator with the tank coil for the oscillator acting also as a magnetic dipole transmitting antenna. Antenna efficiencies of the order of 0.1 percent are obtained, yielding radiated power in the sub-microwatt region. The antenna is constructed of copper or aluminum and has a figure eight directional pattern. The complete transmitter without batteries weighs approximately 10 grams and costs approximately $8.00 for parts. Instructions for building transmitters are given. Transmitters were fastened to rabbits and skunks by means of harnesses and to rabbits, skunks, and raccoons by collars. The harnesses did not prove satisfactory for long-term attachment. The receiver is a portable, battery-powered unit weighing 10 lbs including the batteries. It is crystal controlled on 44 switched channels with a 4 db noise figure and a 30 CPS bandwidth. A receiving system was assembled with commercially available units and used successfully for tracking skunks. The components of this system are a military surplus receiver (BC-453), a radio range filter (FL-13), and two transistorized radio frequency converters. The portable receiver is well adapted for tracking on foot using the null of its attached loop antenna for obtaining bearings on the animals carrying transmitters. The transmitters operate on different frequencies to avoid interference in taking bearings and to provide for individual identification. (a-1, b-3, c-1, d-1, e-0, f-Biotelemetry)

4772. MACPHITE, R. H., "On Maximizing the Signal-to-Noise Radio of a Linear Receiving Antenna Array," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 65, Contract No. AF 33(657)10474; January 1963. ABSTRACT: A very desirable goal in any radio communications system is to have a good receiving antenna. Now it is well known that in addition to responding to the desired signals, the antenna, to a greater or lesser degree, must also respond to the unwanted fields of external noise sources. Examples of the latter are atmospheric discharges, automobile ignition, the Sun, radio stars, jamming signals and other communication signals. In practice the usual procedure is to design the antenna so that its pattern has low side lobes and, it is hoped, rejects most of the noise. It is clear that this is a rather imprecise approach to the problem since it does not take into account the actual distribution of noise sources which in some specific cases may be more or less unique. Indeed, it should be possible, for any antenna located in a specific noisy environment, to select its pattern so that its rejection of the noise is in some sense optimum. In this paper this is defined to be the maximizing of the time-averaged signal-to-noise power ratio at the antenna's terminals. More specifically, we will consider the case of an incoming signal from some known direction which is in the presence of an arbitrary background noise distribution. The signals and noise will be assumed to be stationary functions of time. The antenna will be one whose aperture weighting function varies only in one direction, i.e., it can be thought of as a one-dimensional linear antenna. In recent years such antennas have been viewed as filters of the spatial frequencies of the source distribution. In this paper the calculus of variations will be used to derive an integral equation in the spatial frequency domain for the unknown optimum aperture weighting function of the antenna. A solution to the integral equation is formally obtained as an infinite Fourier series the coefficients of which are the solution to an infinite set of equations. In practice this set of equations must be truncated and an approximate solution in the form of a finite series is obtained. If the aperture size in wavelengths is (L/λ), then it is best to truncate the series at $2(L/\lambda) + 1$ terms. Taking more terms will indeed increase the signal-to-noise ratio even more but at the expense of having an unstable supergain condition. Indeed, it is shown that the problem of supergaining an antenna is equivalent to that of maximizing the signal-to-noise ratio when the noise distribution is uniform and incoherent. In addition to the continuous aperture we consider the case of the optimum linear array and obtain an exact solution for the optimum weighting coefficients of the array elements. The analysis is valid for any type of noise distribution including a totally coherent one. However, the special case of an incoherent distribution is dealt with separately and it is shown to lead to a simpler solution to the problem. (a-1, b-3, c-1, d-1, e-596, f-Mathematical analysis)

4773. MALEY, S. W., AND BAHAR, E., "Model Studies of the Influence of Ionosphere Perturbations on VLF Propagation," Colorado University, Boulder, Technical Summary Report, Contract No. CST-7348, ASTIA No. AD-420 379; 1 January 1963. ABSTRACT: The objective of this investigation is the use of models to study propagation in the earth ionosphere-waveguide for cases in which the effective height of the ionosphere changes along the path of propagation. The models in this investigation will be used to directly gain information as to the effect of perturbations in the ionosphere upon propagation; they will also be used to prove or disprove the validity of approximate mathematical solutions. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

4774. SHERRILL, W. M., AND CASTLES, M. P., "A Survey of the Polarization of the Radio Emission from the Planet Jupiter at Decameter Wavelengths," Southwest Research Institute, San Antonio, Texas, Project 170-6-IR, Final Report; 1 January 1963. ABSTRACT: The polarization characteristics of the decameter nonthermal radio emission from the planet Jupiter have been observed at Southwest Research Institute during the 1962 apparition. This report is devoted to the description of the two-helix polarimeter constructed for this purpose and the polarization data obtained in the frequency range 15 to 27 mc. Jovian noise emissions were observed at 27.2, 24.2, 22.2, 20.2, 19.2, 18.2, 17.2, 16.2 and 15.2 mc. The polarization survey showed a significant trend toward left hand and mixed polarized radiation at frequencies below 20 mc. The six mixed polarized occurrences observed show two types of mixed events. One type showed systematic change from left to right hand sense at a given frequency over periods of an hour. The other type showed maximum rate of change of polarization sense of the order of four times per minute at a given frequency. Right hand and left hand bursts were observed which could be associated with each of the three principal sources at System III longitudes 110°, 230°, 320°. The axial ratios averaged for each source showed AR ≈ ±1.2 for the 230° source with more elliptical axial ratios of the order of ±2 for the sources at 110° and 320°. These data are in general agreement with the most recently published data for previous apparitions of the planet. The mixed polarized observations indicate the rapidly fluctuating propagation conditions in the Jovian and/or interplanetary medium which must be accounted for by any model of the Jovian source. On the basis of the results obtained for the 1962 apparition, recommendations for further Jupiter observations at SwRI with an improved installation are suggested which would make possible a truly unique contribution to the radio observation of the planet. (a-1, b-3, c-1, d-1, e-1000, f-Experimental results)

4775. ARCHBALD, R., HOFFMAN, D., RARITY, J., RASHIP, M., AND WEISS, G., "Special Purpose Analysis Techniques," New York University, College of Engineering, New York, Quarterly Report No. 4, Contract DA 36-039-sc-89154, ASTIA No. AD-407 130; 5 January 1963. ABSTRACT: The progress made in the experimental setup of a computer analyzer for signal analysis problems is made in this report. A computer program to compile and maintain a file of signals based on signal frequency and average prf is explained. The current state of a high speed conversion buffer for collecting detailed signal pattern data outside the computer at high speed is outlined. A description is given of an automatic direction finding system potentially capable of providing an azimuth vs frequency display. (a-1, b-3, c-1, d-1, e-0, f-See also Abstract No. 4597)

4776. ANONYMOUS, "GZ Bearing Angle Error Resulting from Sensor Siting Error," General Electric Co., Syracuse, New York, Contract AF 19(628)514, ASTIA No. AD-296 098; 16 January 1963. ABSTRACT: The requirements for accuracy of EM/D/F site location for two bearing errors are analyzed. Results indicate that the required location accuracy is of the order of + or - 100 feet. This research deals only with accuracy of antenna location and not with the accuracy of pointing. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4777. ANDERSON, W. L., Correction to "Fields of Electric Dipoles in Sea Water - The Earth-Atmosphere-Ionosphere Problem," J. Res. Nat. Bur. Stand., vol. 67D, no. 1, p. 63; January-February 1963. ABSTRACT: A recalculation of the numerical results presented in the paper, "Fields of Electric Dipoles in Sea Water - The Earth-Atmosphere-Ionosphere Problem" has shown that values for the mode solutions, $E1\rho^{(v,m)}$ and $E1\rho^{(h,m)}$ were in error. Corrected figures show the horizontal to be superior to the vertical dipole over the entire range of 1-1000 c/s, by virture of the mode solution. (a-1, b-1, c-1, d-1, e-0, f-Article erratum. See Abstract No. 4654)

4778. VOGLER, L. E., "Point-to-Point Communication on the Moon," J. Res. Nat. Bur. Stand., vol. 67D, no. 1, p. 5; January-February 1963. ABSTRACT: This paper presents a preliminary study of point-to-point communication systems on the surface of the moon. Ground wave propagation is assumed over a lunar model consisting of a smooth sphere of homogeneous material in free space and attenuation curves are presented for a wide range of electromagnetic ground constants. The communication system is described in terms of the power required at the input terminals of the transmitting antenna in order to obtain a given signal-to-noise ratio at the receiver. Discussions of antenna considerations and noise effects are presented and an example is given of a system composed of a Beverage wave antenna transmitting towards a vertical electric dipole. For ground conductivities on the order of 10^{-4} to 10^{-3} mhos/m this example indicates an optimum frequency lying in the LF band and a communication range out to somewhat beyond 100 kilometers, depending on the type of service desired. (a-1, b-1, c-1, d-1, e-557, f-Study and investigation)

4779. CAMERON, D. E., "Modification to AN/UPD-501 for Narrow Pulse Reception," Central Experimental and Proving Establishment, CEPE 1678, ASTIA No. AD-336 573; February 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-7, e-0, f-0)

4780. MURTY, Y. S. N., AND KHASTGIR, S. R., "The Refractive Index and the Absorption Index of the Ionosphere," J. atmos. terrest. Phys., vol 25, pp. 102-103; February 1963. ABSTRACT: For studying the propagation characteristics of a radio-wave through the ionosphere it is necessary to draw the dispersion, absorption and polarization curves showing the refractive index, absorption index and the polarization parameters as functions of electron number density, electron-collisional frequency and wave-frequency. Various laborious methods were followed for the purpose but there were no analytical expressions for these characteristics which could be directly obtained from the magnetoionic formulae of Appleton and Hartree. Murty and Khastgir (1959, 1960), however, derived expressions for the polarization parameters ρ and ϕ, (where ρ is the ratio of the amplitudes for the normal to the abnormal components of the magnetic vector of the radio-wave and ϕ the phase-difference between them) from the magnetoionic formulae for the direct determination of the polarization characteristics under different conditions. In the present communication, analytical expressions have been obtained for computing the refractive index and the absorption index for various values of electron number density, electron collisional frequency and wave-frequency. The derivation of the expressions for the refractive index and the absorption index for radio-wave propagation through the ionosphere is given. (a-1, b-1, c-1, d-5, e-0, f-Propagation study)

4781. INTERNATIONAL FREQUENCY REGISTRATION BOARD (I. F. R. B.), "International Frequency List," published periodically. Most recent publication 1 February 1963 (plus supplements). Published by l'Union Internationale des Telecommunications, Geneve. ABSTRACT: A listing by frequency of all known radio transmitters in the world with the exception of certain military and other specialized transmitters. The lists continue in several volumes beginning in the vicinity of approximately 13 kcs and continuing through the microwave range. The current listing claims to list all frequency assignments between 10 kcs and 40,000 mcs. The longitude and latitude coordinates to the nearest minute of each assigned frequency are listed with other miscellaneous information related to location, the localities with which communications is established, type of emission, hours of operation, ownership, and other miscellaneous information. This is often referred to as the Berne List. (a-4, b-3, c-8, d-13, e-0, f-Station listing)

4782. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Progress in the Development of a Radio Direction Finder Utilizing the 8-Loop Fixed Spaced Loop Antenna and Experiments with Through-Mast Antennas for Radio Direction Finding," Southwest Research Institute, San Antonio, Texas, Contract NObsr-89167, Interim Report No. 1; 1 February 1963. ABSTRACT: The 8-loop D/F system development is reviewed. Increased system sensitivity has been obtained by the use of transistorized antenna preamplifiers. Two 8-loop D/F systems with simultaneous twin channel D/F display and goniometer D/F displays are discussed. The first system incorporates components available at Southwest Research Institute while the second system will use synthesizers for fast frequency control of the twin channel receiver. Procedures for modifying DAQ goniometers for operation without self-resonance are given for the frequency range of 15 to 32 mc. A proposed hybrid antenna design is described which will yield the spaced loop mode and the simple loop mode from the same antenna. Several "through-mast" antennas now under consideration are described. These include a through-mast crossed space loop antenna, a through-mast crossed simple loop antenna, and simple loop antennas around a large circular screen. Other project work including planned shipboard tests of the Servo DFG-4 Doppler direction finder and the Southwest Research Institute AN/SRD-7 three-loop antenna is discussed. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4783. BRUCE, J. D., "Error Analysis of Phased-Array Direction Finders," Sylvania Electric Products, Mountain View, California, Electronic Defense Laboratories, Contract DA 36-039-sc-87499, ASTIA No. AD-600 429; 18 February 1963. ABSTRACT: An antenna array using multiple beams for direction finding has certain inherent errors associated with its use. Two error expressions are employed to give a measure of the accuracy obtained with this antenna system. One of these is called the maximum average error and the other the expected error. Five different operating conditions are investigated. They are: (1) the ideal case, where all beams are assumed to have the same form; (2) the unequal beamwidth case, where the effect of broadening the beam pattern when directed away from broadside is considered; (3) the unequal gain, equal beamwidth case that considers the effect of receiver gain imbalance; (4) the unequal gain, unequal beamwidth case, which is a combination of the effects of the second and third above conditions; and (5) the random signal detection case, which treats the problem of certain intercepts remaining undetected. Comparisons are made with the ideal case for all nonideal operating conditions and are displayed in graphical form. The effect of beam broadening is shown to be quite small. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4784. CRUZAN, O. R., "Analysis of an Indirect Radio-Location Method," Harry Diamond Laboratories, Washington, D.C., Project DA 5N06-01-013, Report No. TR-1094, ASTIA No. AD-335 595; 28 February 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4785. BAILEY, A. D., AND MCCLURG, W. C., "A Sum-and-Difference Interferometer Systems for H. F. Radio Direction Finding," IEEE Trans., vol. ANE-10, no. 1, pp. 65-72; March 1963. ABSTRACT: Radio interferometers have been used for high-accuracy, high-precision source location of radio stars and radio satellites. These systems are generally optimized for a fixed frequency and have efficient means for resolving any and all ambiguities which are inherent in the particular interferometer system. Application of the radio-interferometer principle to wide-band, high-frequency radio direction finding practice by its very nature poses a severe problem of ambiguity resolution, i.e., unique determination of the bearing and elevation angles of arrival of an incident ray having any frequency within the band. A wide-band, high-frequency radio direction finder incorporating sum-and-difference interferometer techniques is described. A salient and novel feature is an analogue computer-type calibrator which permits unique determination of the bearing and elevation angles of arrival from data supplied by three two-element interferometers and a central crossed Adcock array. A theoretical analysis is given along with supporting experimental data. (a-1, b-1, c-1, d-1, e-682, f-Study and investigation)

4786. ISLAM, M. A., "A Theoretical Treatment of Low-Frequency Loop Antennas with Permeable Cores," Trans. IEEE, vol. AP-11, no. 2, pp. 162-169; March 1963. ABSTRACT: A solution for the retarded vector potential due to a circular loop of current is derived from Maxwell's equations and the standard boundary conditions that

the tangential component of E is strictly continuous across the boundary, and the difference of the tangential components of H on the boundary is equal to the true surface current. The geometry of the permeable core dictated the use of a circular cylindrical coordinate system for the problem. The dimensions of the current loop are assumed to be small, compared to the wavelengths of the field quantities involved to justify the assumption of uniform current density throughout the loop. It is shown that the resultant potential consists of two parts: one part is due to the loop only; and the other part is due to the presence of the permeable core. Using the expressions for the retarded vector potential, the Poynting vector and the rate of energy outflow are calculated. The power outflow is evaluated using a computer for certain sets of parameters. The way in which a similar procedure could be used to obtain solution for a prolate spheroidal core is indicated. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4787. JACKEROTT, I. M., TAAGHOLT, J., AND UNGSTRUP, E., "Whistler and VLF-Emissions from Saltholm, Denmark 1960-1961," Technical University, Copenhagen, Denmark, Report Nos. 15, TN1, Contract No. AF 61(052)652, ASTIA No. AD-421 798; March 1963. ABSTRACT: The whistler and VLF-emissions data from the Danish station on Saltholm near Copenhagen for 1960 and 1961 are presented. The data are given with summary tables and graphs of diurnal and seasonal variations of the observed phenomena, viz., whistlers, chorus and hiss. (a-1, b-3, c-1, d-20, e-0, f-Sferics)

4788. MACPHIE, R. H., "Application of Cross-Correlation Techniques to Linear Antenna Arrays," University of Illinois, Electrical Engineering Research Laboratory, Technical Report No. 67, Contract No. AD 33(657)10474; March 1963. ABSTRACT: This thesis is concerned with the application of cross-correlation techniques to linear antenna arrays. The basic cross-correlation system, which is considered, consists of two linear receiving arrays excited by a distribution of remote radio sources. The terminal voltage of each array is passed through a narrow-band RF filter and the two resulting signals are cross-correlated. It is demonstrated that this system can measure the mutual coherence function of the source distribution. To do this the patterns of the two antennas must be scanned independently. A Fourier analysis shows that the cross-correlation system's output is a filtered version of the mutual coherence function. From this output a three-dimensional principal solution can be deduced; it is a generalization of the one-dimensional principal solution given by Bracewell and Roberts in connection with radio astronomy. In addition to cross-correlating the voltages obtained from two distinct arrays one can perform a cross-correlation of signals obtained from one of the arrays. By dividing the signal from each element into two parts (with predetermined weighting), and by combining additively each set of signals, one obtains two output voltages from what are effectively two coincident arrays. These signals are then cross-correlated in the usual fashion. A similar cross-correlation can be performed on the voltages obtained from the other array of the system. Finally, a fourth cross-correlation function results when the signals of the two arrays are combined in reverse order and it is the complex conjugate of the original cross-correlation function. These four distinct outputs are the elements of the 2×2 correlation matrix of the system. A Fourier analysis of the correlation matrix leads to a more general principal solution for the system as a whole. (a-1, b-3, c-1, d-1, e-621, f-Theory and analysis)

4789. MARCHAND, N., "Studies in Selected Subjects in Navigation and Data Acquisition for Air Traffic Control," Marchand Electronics Laboratories, Condensed Final Report, Contract FAA/BRD-26; March 1963. ABSTRACT: Chapter headings include the following: σ rms as a measure of two dimensional variance; the evaluation of error standard deviation in the accuracy evaluation of the Doppler navigator; error distribution in a combined vortac-Doppler navigation system; the derivation of the error standard deviation for the Doppler navigator when flying any arbitrary course between departure point and destination; propagation-of-error equations for airborne Doppler navigation in the general case given the error distribution of the starting fix; propagation-of-error equations for airborne Doppler navigation using either a rho-theta or hyperbolic position determination as a starting fix; control of experimental navigation data; mathematical model for determination of loran - a error distribution in the North Atlantic; theory of extreme values applied to maximum deviation off-course for North Atlantic navigation; the error distributions of position locations determined from simultaneous multiple D/F bearings; error distribution in hyperbolic location systems; error distribution of optimum position locations from multiple time difference hyperbolic networks; determination of criteria to be used in the selection of observation points for target position computations from multiple time difference hyperbolic networks; a suggested method for the elimination of slant range error in an aircraft hyperbolic location system; direction finders for ATC. (a-1, b-3, c-1, d-1, e-742, f-Study and investigation)

4790. ANONYMOUS, "Tactical Warfare Strike Intercept System. Volume I," Martin Marietta Corporation, Baltimore, Maryland, Final Report, Contract AF 33(657)8713, ASTIA No. AD-335 782; April 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4791. EDSON, J. B., AND GOLDMAN, S. C., "Testing of Ionospheric Absorption Measurement Equipment and Study of Improved Techniques for Data Collection," Aerospace Research, Inc., Boston, Mass., Project MIPR 520-62, Contract No. AF 19(628)359, ASTIA No. AD-417 643; April 1963. ABSTRACT: A transistorized Riometer Mark II absorption measuring equipment was tested at the Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado, with entirely satisfact y results. Studies were conducted and techniques developed to provide . .tomatic calibration and digital output capability to the Riometer Mar II. A prototype automatic calibrator was built and satisfactorily operated. The requirements and techniques of digital data conversion and recording were investigated, and a suitable system is described. A study was made of antenna systems suitable for use in absorption measurements with riometers. A number of antennas were fabricated and tested. The results are discussed, and the type of antenna which has proven most useful is described. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4792. FRITSCH, V., "Propagation of Radiofrequency Electromagnetic Fields in Geological Conductors," J. Res. Nat. Bur. Stand., vol. 66D, no. 2, p. 161; March-April 1963. ABSTRACT: Propagation of radiofrequency electromagnetic fields in conducting spaces has been the subject of extensive theoretical investigations. Still, the knowledge gained cannot always be applied directly to propagation in the upper strata of the earth. The reason for this is that these strata consist of geological conductors which are arranged in a complicated way. One can, of course, give specified values of conductivity and dielectric constant for geological conductors, and apply these to subsequent calculations. But most theoretical investigations apply either to homogeneous spaces or to spaces having an electrically simple structure. However, the electrical structure of the spaces occupied by geological conductors is almost always very complicated. If this fact is not taken into account sufficiently, one can never obtain agreement between experimental results and theoretical calculations. The author, who has been dealing with these problems for many years, is trying here to provide a survey of the inherent difficulties due to the complicated structure of geological conductors. Although the pertinent factors have been only very inadequately investigated up to now, it is hoped that further investigations can be stimulated by this discussion. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

4793. JEFFERSON, F. W., "Experimental Investigation of Direction Finder Components Standard Elektrik Lorenz VDF 14 and Standard Telephones and Cables, Limited PQ1A1 CADF Direction Finder Systems," National Aviation Facilities Experimental Center, Atlantic City, New Jersey, Final Report, Project 109-1X, ASTIA No. AD-425 171; April 1963. ABSTRACT: This report concerns the experimental investigation of the Lorenz VDF 14 direction finder system and the standard telephones and cables PQ1A1 CADF direction finder system and bearing telemetering system. It is based on ground measurements and system operational tests. These measurements and tests were conducted to determine the critical characteristics and accuracy of the systems. The report compares the performances of the direction finder systems investigated and makes recommendations to consider the minimum performance characteristics suggested herein for design of an FAA VHF/UHF direction finder system. (a-1, b-3, c-1, d-1, e-0, f-Experimental investigation and evaluation)

4794. KLAHN, R., AND BYRNE, E. R., "The Horn-Antenna Direction System," Bell Lab. Record, vol. 41, no. 4, pp. 130-134; April 1963. ABSTRACT: The Telstar Satellite is a 34-inch sphere which moves through space at speeds exceeding 16,000 miles an hour. During periods of communication, its orbit carries it to altitudes of 3500 miles and as far as 7000 miles from the ground stations. In spanning these great distances, less than a billionth of the 2-1/4 watts of power radiated by the satellite reaches a ground station. Communication to and from this satellite requires an antenna system of unparalleled sensitivity. To establish such a system, the designers of the Telstar satellite system combined the low-noise maser amplifier, the superior signal-to-noise performance of frequency modulation with feedback reception techniques, and a huge horn-reflector antenna at the ground station. The horn antenna concentrates the signals transmitted to the satellite in a very narrow beam and captures the weak signals coming from it. In other words, the narrow beam insures that an adequate amount of power reaches the satellite; at the same time it means that the antenna receives signals from only a small part of the sky. Although this narrow beam is highly desirable from a transmission standpoint, it necessitates an extraordinarily accurate method of pointing the antenna. . .

To prevent pointing errors from degrading the quality of transmission, the huge horn must be pointed at the satellite with errors of less than 0.06 of an angular degree during each transmission period. This requires a precise knowledge of the satellite's position and control equipment to move the 380-ton antenna with watch-like accuracy. Tracking the satellite and controlling movements of the horn antenna are the specific tasks of the antenna-direction system. To create this system, Laboratories engineers drew on the experience they gained from the Echo I satellite experiments where orbit-prediction techniques were used to produce pointing instructions for the ground-station antennas. (a-1, b-1, c-1, d-1, e-0, f-Description)

4795. LEWIS, E. A., "Parametric Formulas for Geodesic Curves and Distances on a Slightly Oblate Earth," Air Force Cambridge Research Laboratories, Bedford, Massachusetts, Contract AFCRL 63-485, ASTIA No. AD-412 501; April 1963. ABSTRACT: Approximate expressions for geodesic curves and the geodesic arc-lengths are obtained by straight forward methods which permit upper bounds of error to be established analytically. The errors are typically less than 1.4 parts per million, and even higher accuracy is possible with additional corrections. Selected numerical examples are given, and calculated arc-lengths are compared with values obtained with Andoyer's approximate formula. (a-1, b-3, c-1, d-1, e-0, f-Theory)

4796. PEREGRINO, L., AND HALVERSON, H. L., "Using the Smith Chart with Negative Real-Part Impedances or Admittances," Hewlett-Packard Journal, vol. 14, no. 7-8, p. 8; March-April 1963. ABSTRACT: In high-frequency design work, impedance charts such as the Smith Chart are widely used to simplify design problems. The Smith Chart, though, since it is a plot of the right half of the complex impedance plane, does not include negative real-part impedances. Hence, to plot negative-impedance devices such as the Esaki diode thereon, a transformation must be used to transform the left half of the plane into the Smith Chart. Several transformations have been proposed in the literature which do this but they suffer from one or more disadvantages which make them difficult to use. The transformation described here allows the Smith Chart to be used directly without any modification or relabeling. The rules for using the chart with negative real part impedances or relabeling. The rules for using the chart with negative real part impedances or admittances are: (1) Change the sign of the real part of the impedance (admittance) only. (2) Normalize the impedances (admittance) in the usual way and plot on the chart. (3) The magnitude of the true reflection coefficient is the reciprocal of that read on the chart. (4) The true angle of the reflection is the angle read on the chart. (a-1, b-3, c-1, d-1, e-429, f-Theory)

4797. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Progress Report No. 9, Contract DA 36-039-sc-84966, ASTIA No. AD-409 078; April 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4733)

4798. RIEKER, J., "Sunset and Sunrise in the Ionosphere: Effects on the Propagation of Longwaves," J. Res. Nat. Bur. Stand., vol. 67D, no. 2, p. 119; March-April 1963. ABSTRACT: The purpose of this study, which is based on photographic recordings showing the phase shift of two signals - i.e., GBR transmitted from Rugby (England) on 16 kilocycles per second and NBA transmitted from Balboa (Panama) on 18 kilocycles) per second, both received at the Neuchâtel Cantonal Observatory (Neuchâtel, Switzerland), is twofold: (1) To investigate the mode of propagation of the GBR and NBA signals. (2) To study the relation between the time of sunrise, respectively sunset at various ionospheric reflection points and the times at which phase fluctuations appear on the recordings. The author then generalizes the notion of the times of sunrise, respectively sunset by introducing the closely related concept of the zenithal distance Z of the sun at the reflection points considered. Following results published in literature, reflection point altitudes were assumed to be about 70 kilometers during the day. Results were such that: (a) For the GBR signal; only a one-hop mode is available, night reflection altitudes varying between 88 and 9? kilometers on individual recordings, angles of incidence ϕ on the ground between 7°36' and 10°25'. (b) For the NBA signal; a five-hop mode is available, night reflection altitudes varying between 80 and 84 kilometers on individual recordings, angles of incidence ϕ on the ground between 0°27' and 1°14'. (c) At sunrise, respectively, sunset, computed zenithal distances for one and the same reflection point at times identical with singularities appearing on successive recordings show a striking analogy. (d) During one and the same sunrise or sunset, the zenithal distances computed successively for various reflection points and related to singularities read on a same recording present also a striking analogy. (e) The time of onset of ionizing radiation at all night reflection points seems to be of major importance for both the propagations of the GBR and NBA signals During sunset, the altitude of the day reflection point which was stabilized at around 70 kilometers increases as soon as the zenithal distance of the sun exceeds 90°. At sunrise, on the other hand, the altitude of the reflection point stabilizes at around 70 kilometers, when the zenithal distances of the sun reach or go below 90°. (f) In the case of the NBA signal a phase fluctuation already occurs at a zenithal distance of about 103°, especially at sunrise. At that moment, the distance between the reflection point and the layer formed by the ionizing radiations of the sun is about 100 kilometers. (g) At sunrise, the curves showing the energy of the received signals display the following features: For a one-hop mode (Rugby), a momentary strong absorption when the reflection point altitude reaches 82 kilometers; in the case of several ionospheric reflections (Balboa), a succession of absorption lines corresponding to the successive diminishing of the altitude of the ionospheric reflection points. (h) At sunset, the interpretation of the energy is more delicate: For a one-hop mode (Rugby), a momentary increase occurs in the energy of the signal before the night level of reflection is reached; in the case of a five-hop mode (Balboa), the interpretation of the absorption curve is difficult because five ionospheric reflection points change their altitude and the resulting phase fluctuations become entangled. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

4799. SEELEY, E. W., "Two- and Three-Loop Superdirective Receiving Antennas," J. Res. Nat. Bur. Stand., vol. 67D, no. 2, pp. 215-235; March-April 1963. ABSTRACT: The characteristics of two- and three-loop superdirective aerial arrays are presented. At vlf this type of array appears to have many desirable qualities, and the usual detrimental characteristics associated with superdirectivity are less in evidence. It is shown that the beamwidth is narrowest, the front-to-back voltage and power ratios are greatest, and the position of the back lobes and nulls are most invariant when closely spaced loops are used. Inequalities in signals from the individual loops tend to obscure the front and back lobes and limit the proximity of the loops. (a-1, b-1, c-1, d-1, e-609, f-Analysis and evaluation)

4800. SWEEZY, W. B., AND BEAN, B. R., "Correction of Atmospheric Refraction Errors in Radio Height Finding," J. Res. Nat. Bur. Stand., vol. 67D, no. 2, p. 139; March-April 1963. ABSTRACT: Atmospheric refraction errors in height finding radars are studied by means of detailed refraction calculations for a wide range of meteorological conditions. For targets up to 70,000 feet above ground and 150 miles ground distance from the radar site, the mean height error was found to be as much as 5,000 feet with a standard deviation of 1,200 feet. A correction for the surface value of the refractive index at the radar site would eliminate the mean height error and reduce the maximum standard deviation to less than 900 feet. An additional correction for the initial gradient of the refractive index and the value of the refractive index at one kilometer above the surface would reduce the maximum standard deviation to less than 400 feet. Methods of correcting height errors based on available meteorological data are presented and shown to be operationally practical. (a-1, b-1, c-1, d-1, e-0, f-Study and analysis)

4801. SEELEY, E. W., "N-Loop VLF Superdirective Arrays," Naval Ordnance Laboratory, Corona, California, NOLC Report 580; 1 April 1963. ABSTRACT: Superdirectivity may be achieved with short VLF loop arrays because the beam width depends only upon the number of loops and not upon the length of the array. In addition, the usual factors limiting superdirectivity are not as prevalent in these arrays because of the decoupling between VLF loops. Expressions are derived for the beam width, effective height, reception pattern, amplitude and position of the back lobes, and the effects of voltage phase and amplitude differences between loops. These equations describe short arrays of any number of loops. The most serious limitation concerning the directivity of superdirective loop arrays is caused by the voltage phase and amplitude differences between loops. These differences between adjacent loops combine to obscure the nulls and deteriorate the reception pattern. (a-1, b-3, c-1, d-1, e-608, f-Analysis)

4802. TRAVERS, D. N., "Performance Characteristics of a Spaced Loop Antenna, Formed by Two Arbitrarily Oriented Parallel Loops," Southwest Research Institute, San Antonio, Texas, Contract No. NObsr-89167, Task Summary Report Number XIII; 1 April 1963. ABSTRACT: The spaced loop antenna is of interest in HF-D/F because of improved performance relative to the simple loop when reradiating objects are nearby. It is therefore of interest to study other characteristics of the spaced loop, such as sensitivity. This report makes available in a single reference a complete listing of the important performance characteristics of the spaced loop antenna. The exact field equations of a general spaced loop are derived and used as a basis for the coaxial and coplanar spaced loops as special cases. Any two loop spaced loop operating in the quadrupole mode may be treated as a special case. Field patterns are derived for near and far fields, for azimuth and elevation planes, and for both vertical and horizontal

polarization, for any spaced loop. These results are plotted to show that certain spaced loops have pattern variations as a function of distance to the source. The field equations are then used to compute the radiation resistance, the effective height, effective area, gain, signal-to-noise ratio, noise figure, minimum observable field strength and impedance. Other characteristics including reradiation error reduction, pattern variations with source distance, construction difficulties and pattern distortion sources are reviewed. Although the report begins with very general concepts concerning a spaced loop, all important formulas are explained with numerical examples so that practical conclusions may be drawn. (a-1, b-3, c-1, d-1, e-1000, f-Evaluation)

4803. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Shipboard Tests of the DFG-4 VHF-UHF Direction Finder with the Antenna in Nonoptimum Sites," Southwest Research Institute, San Antonio, Texas, Task Summary Report Number XIV, Contract No. NObsr-89167; 2 April 1963. ABSTRACT: Shipboard tests of the Servo Corporation DFG-4C Doppler radio direction finder system were conducted on the USS Brownson (DD-868) in March 1963 to determine the bearing error performance of the equipment with the antenna located in two nonoptimum sites. The first site was on a mast located on the starboard side of the deck immediately above the pilot house with the center of the antenna approximately 12 feet above the deck. The second antenna location was on a short mast near the center of the aftstack, approximately 5 feet above an ECM antenna platform. Calibration curves were obtained at each of eight frequencies between 225 and 400 mc for both locations. These curves show considerable deviation and a number of re-entrants; however, certain curves for both sites showed fairly constant error amplitude over large azimuth sectors. The ability of the DFG-4C equipment to provide long-term integration of the bearing display was advantageous in this test because of the rapid swing of the indicated bearing in short integration times. It is concluded that the DFG-4C VHF-UHF direction finder equipment will provide satisfactory bearings over certain azimuth sectors for the nonoptimum sites tested. Improved siting, in the form of additional height of the aftstack site, should further improve the performance of the equipment. (a-1, b-3, c-1, d-1, e-1000, f-Evaluation)

4804. ARCHBALD, R., HOFFMAN, D., RARITY, J., RASHIP, M., AN WEILL, G., "Special Purpose Analysis Techniques," New York University, College of Engineering, New York, Quarterly Report No. 5, Contract DA 36-039-sc-89154, ASTIA No. AD-409 499; 5 April 1963. ABSTRACT: A computer program for determining the direction of a signal using the computer analyzer is described. Preliminary analysis for setting the threshold on the computer analyzer is outlined. A description is given of a proposed miniature signal recorder using a fiber optic coupling medium between a small cathode ray tube and photographic film. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4775)

4805. ANONYMOUS, "Design, Development, and Fabrication of US Navy Integrated Electronics Central AN/ASQ-85( ) (XN)," RCA Defense Electronic Products, Camden, New Jersey, Interim Report No. 3, Contract NOw62-0965d, ASTIA No. AD-414 963; 12 April 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Progress report)

4806. SCHMIEDER, R., "Report on Evaluation of the General Electric Company Type KD 10AA Directional Gyro," Aeronautical Instruments Laboratories, Naval Air Development Center, Johnsville, Pennsylvania, Report No. NADC AI 6325, ASTIA No. AD-403 658; 18 April 1963. ABSTRACT: The test and evaluation of the General Electric Type KD-10AA directional gyro proposed as a retrofit for the directional gyro in the present MA-1 compass systems are presented. The gyro incorporates rotating bearing races to reduce random drift. The drift rates were within the ±1.0 deg. design tolerance under standard vibration conditions. The drift rates during the Scorsby tests were noted to vary as a function of the gyro spin axis heading with respect to the Scorsby table. The drift rates varied from +3 to -4 deg. per hour (going through one cycle) as the spin axis rotated 360 deg. in azimuth. The gyro drift rates were noted to be as high as -8 deg. per hour under standard vibration at a -55°C temperature. The latitude seeking system of the MA-1 compass controller was also found to introduce a random drift error of as much as ±1.0 deg. per hour. During flight tests, the gyro precessed whenever the plane made a turn. This precession amounted to about -2 deg. during a 360 deg. clockwise turn and about +4 deg. during a 360 deg. counterclockwise turn. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

4807. MEINKE, H. H., "Research on Electrically Small Antennas," Institut Fuer Hochfrequenztechnik Technische Hochschule Muenchen, Contract AF 61(052)506, Summary Report 2; 30 April 1963. ABSTRACT NO. 1: A performance improvement of the electrically small antenna can only be obtained by achieving a bandwidth enlargement of the antenna impedance. By surrounding the antenna with ferrite of the same maximum height as the antenna a bandwidth enlargement is only possible if the geometrical height of the antenna becomes larger than about 1/20 of the wavelength in air. The outer regions of the ferrite form cause this bandwidth broadening effect. Stability problems and measurement of input impedance with negative resistances are discussed. A folded unipole with a tunnel diode at its top is studied experimentally. ABSTRACT NO. 2: This research is concerned with the improvement of the impedance of dipoles small compared to the wave length in free space. This improvement should be obtained as a result of directly surrounding the dipole with dielectric or magnetic medium. The surrounding shape should not have too large a volume since the resulting increase of antenna size should be kept small. Sect. I states exactly those characteristics of impedance behaviour which should be improved, especially efficiency and bandwidth of the dipole. The value of the radiation resistance itself is not very important. Sect. II gives a summary of the physical effects introduced by a surrounding dielectric. Two different effects are:(1) An altered impedance transformation since the wave impedance in the region of the radiator has been changed. (2) A stronger formation of space waves since the wave length in the dielectric is smaller than in air causing a larger ratio of radiator length to wavelength within the dielectric. Sect. III, IV and V contain the fundamental theory. Sect. VI shows how the theory is specially used for very short antennas. In this case only the transforming effect is working. The theory is checked by measuring the impedance of a radiator in air and in differently shaped dielectric mediums of Polystyrol. (a_1-1, a_2-1, b-3, c-1, d-4, e-616, f-Theory and experiment)

4808. CHEN, C. L., AND KING, R. W. P., "The Small Bare Loop Antenna Immersed in a Dissipative Medium," Trans. IEEE, vol. AP-11, no. 3; May 1963. ABSTRACT: The input admittance of a small thin-wire circular loop antenna, driven by a slice generator, immersed in a dissipative medium, is considered. It is found that the solution given by Storer for the loop antenna in a lossless medium can be carried over readily by replacing ζ_0 by ζ, and k_0 by k. The numerical values of the normalized input conductance and input susceptance of a small loop antenna, namely $\beta b < 0.3$, $\Omega = 10$, are calculated. It is to be noted that the input susceptance is practically independent of k while the input conductance changes as much as seventeen times in this special case. (a-1, b-1, c-1, d-1, e-727, f-Theory)

4809. CLIFFORD, V. F., AND KLEIN, R. R., "Electronic Equipment, Modification Kits MK-514( )/TRD-4A and MK-515( )/TRD-4A," ITT Federal Laboratories, Nutley, New Jersey, Final Report, Contract DA 36-039-sc-85171, ASTIA No. AD-405 618; May 1963. ABSTRACT: Research and development is presented on the effort to develop and furnish modification kits which enable the modification of high frequency medium frequency direction finder set AN/TRD-4. The modified equipments are transportable radio direction finders capable of taking bearings on skywave and groundwave signals in the frequency range 0.5 to 30.0 mc. These equipments exhibit improved direction finding sensitivity and include facilities for dual operation on two signals simultaneously. Seven modification kits, electronic equipment MK-514( )/TRD-4A, were furnished. Each kit converts an AN/TRD-4 equipment to a direction finder set AN/TRD-18( ) containing the above features. A pilot installation of a MK-514( )/TRD-4A modification kit was made using a direction finder set AN/TRD-4. Three modification kits, electronic equipment MK-515( )/TRD-4A, were also furnished. Each kit converts an AN/TRD-4 to direction finder set AN/TRD-19( ) which provides semi-automatic read out and recording of azimuth and time, a new, improved radio transmitter and in addition, all the features of the MK-514( )/TRD-4A kit. (a-1, b-3, c-1, d-1, e-0, f-Development and modification)

4810. COLIN, R. I., "Standard Radio Navigation Aids Serving the World of Aviation," Alta Frequenza, vol. 32, no. 5, pp. 338-350 (66E-78E); May 1963. ABSTRACT: Air-Navigation aids, based on the use of radio-electronics systems, are illustrated, summarizing their principles of operation and the extension of their use in the present air transport services. Systems for short distance navigation are first treated, particularly: the Automatic Direction Finder; the lf/mf Four-Course Radii Range; the vhf Omnidirectional Range; the vhf Marker Beacons; the uhf Distance Measuring Equipment; and the Military Tactical System (TACAN). Systems for the approach and landing zone are then considered. These include the Instrument Landing System and the Ground Controlled Approach. Finally, navigation systems for long distance are illustrated: Decca; Loran (A and C); Omega and Consol Systems. (a-3, b-2, c-9, d-9, e-0, f-Survey of systems)

4811. GREENE, J. C., AND SHARPE, E. D., "Direction Finding Techniques for HF Wire-Grid Lens Antenna," TRG, Inc., Palo Alto, California, Technical Report No. 3, Contract AF 30(602)2742, ASTIA

No. AD-411 836; May 1963. ABSTRACT: This report presents a preliminary study of the direction finding properties of the HF wire-grid lens antenna. Theoretical sum and difference patterns for this antenna are given which are used in the evaluation of various electronic direction finding systems with respect to the accuracy obtainable and the circuit complexities required. The direction finding systems investigated are the monopulse, amplitude-comparison, and phase-comparison systems. (a-1, b-3, c-1, d-1, e-0, f-Study)

4812. KING, R. W. P., AND IIZUKA, K., "The Complete Electromagnetic Field of a Half-Wave Dipole in a Dissipative Medium," Trans. IEEE, vol. AP-11, no. 3; May 1963. ABSTRACT: The electromagnetic field of a dipole antenna immersed in a homogeneous isotropic dissipative medium is studied theoretically and experimentally. Expressions are obtained for the electric and magnetic fields both near and far in terms of currents and admittances that are more accurate than in conventional formulations. The elliptically polarized field near a half-wave dipole is evaluated theoretically and compared with experimental measurements over a wide range of values of attenuation. (a-1, b-1, c-1, d-1, e-741, f-Theory)

4813. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Menlo Park, California, Quarterly Progress Report No. 10, Project No. 3E44-02-84966, SRI Project No. 3335, Contract No. DA 36-039-sc-84966, ASTIA No. AD-347 301; May 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4797)

4814. ROBINSON, N., AND GALIL, U., "Research on Electromagnetic Noise at Extremely Low Frequencies," Israel Institute of Technology, Summary Report No. 1, Contract AF 61(052)555, ASTIA No. AD-439 640; May 1963. ABSTRACT: Data of electromagnetic noise at 5 Kcps have been continuously recorded since August 1962. From these data an analysis of research on electromagnetic noise at extremely low frequencies has been made and results have been published in various journals. (a-1, b-3, c-8, d-23, e-0, f-Experimental investigation)

4815. SINNO, K., AND KIDOKORO, T., "On the Direction Finding and Field Intensity Measurements on San Francisco HF Circuits," Rev. Radio Res. Lab., vol. 9, (42), pp. 115-123; May 1963. ABSTRACT: The results of direction-finding and field intensity measurements of hf waves from San Francisco (20.8173 Mc, 13.7773 Mc, 10.3873 Mc and 7.7123 Mc) received at Hiraiso, 70 miles north-east of Tokyo, from June 1960 to March 1961, are investigated with respect to diurnal variations, time of magnetic disturbances and SID phenomena. The visual direction-finder devised by Miya was used in the measurement with some adaptation for continued recording. It is found that the direction of received wave almost always deviates to the south from the true bearing even in normal condition of propagation, and this deviation increases in disturbed propagation condition, especially in the period of SID. These observational facts lead to the conception that San Francisco circuits, which are considered of a rather simple propagation mode, consist in many multiple waves excited by sea surface scattering. Discussion is presented on the propagation mechanism of this circuit including the scattered waves. (a-3, b-1, c-6, d-6, e-0, f-Experimental results)

4816. ANDERSEN, J. B., "Reception of Skywave Signals Near a Coastline," J. Res. Nat. Bur. Stand., vol. 67D, no. 3, p. 325; May-June 1963. ABSTRACT: An experimental investigation has been made on the influence of ground inhomogeneities on the reception of skywave signals, especially the influence of the conductivity contrast near a coastline. This gives rise to a rapid decrease in field strength near the coastline as is well known from groundwave mixed path theory. Comparison with theory is given. Influence of diffuse reflection from the ionosphere is also considered. (a-1, b-1, c-1, d-1, e-0, f-Study)

4817. BALL, C. O., CLAPP, R. E., DESIZE, L. K., EDWARDS, J. H., AND ESPENLAUB, W. C., "Very-Low-Frequency Antenna Array," Airborne Instruments Lab., Inc., Deer Park, N.Y., Final Report, Project No. 8862, Contract No. AF 30(602)2857, ASTIA No. AD-314 059; June 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4818. FIFE, D. W., "Image Frequency Rejection in a Radio Direction Finder," IEEE Trans., vol. ANE-10, no. 2, pp. 128-132; June 1963. ABSTRACT: An analysis is given of the bearing error in a radio direction finder due to simultaneous reception of two signals, referred to as target and spurious signals. The carrier frequency of the spurious signal is assumed to be the image of the target-signal frequency around the local-oscillator frequency, so that both signals are passed by the IF amplifier of the direction-finder receiver. The analysis applied to any D/F receiver having a carrier-suppressed double-sideband input, such as is obtained using a mechanical or electronic goniometer. The results can serve as a basis for specifying the image rejection requirements on the rf amplifier of the receiver. In particular, it is shown that in order to have less than one degree of error, the spurious signal must be attenuated to at least 35 dB below the target signal amplitude at the rf output of the receiver. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4819. GDALEVICH, C. L., GRINGAUZ, K. I., RUDAKOV, V. A., AND RYTOV, S. M., "Ionospheric Influence of the Position Determination of Space Rockets," Radiotekhnika i Elektronika, vol. 8, no. 6, pp. 942-949; June 1963. ABSTRACT: Obtains expressions for the ionospheric errors in radio measurement of rocket range, angle and speed, and discusses the possibility of calculating the errors by approximating to the true height distribution of the electron concentration. (a-3, b-1, c-2, d-2, e-0, f-Translation)

4820. GERBES, W., "A Vertical Direction Finding Procedure," Emmanual College, Boston, Mass., Contract No. AF 19(604)8505, ASTIA No. AD-420 432; June 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-4, e-0, f-Translation)

4821. GOOCH, D. W., HARRISON, C. W., KING, R. W. P., AND WU, T. T., "Impedances of Long Antennas in Air and in Dissipative Media," J. Res. Nat. Bur. Stand., vol. 67D, no. 3, p. 355; May-June 1963. ABSTRACT: Graphs are provided for the normalized impedance of center-driven cylindrical dipole antennas when immersed in air or in a dissipative medium. The electric half-length ranges from 1 to 100 for dipoles in air and from 1 to 19.7 for dipoles in a dissipative medium. Three ratios of radius of the antenna to wavelength have been used. The properties of the medium are expressed in terms of the ratio α/β in the range from zero to one where β and α are, respectively, the real and imaginary parts of the complex propagation constant k. (a-1, b-1, c-1, d-1, e-733, f-Theory)

4822. LATMIRAL, G., FRANCESCHETTI, G., AND VINCIGUERRA, R., "Analysis and Synthesis of Nonuniform Transmission Lines or Stratified Layers," J. Res. Nat. Bur. Stand., vol. 67D, no. 3; May-June 1963. ABSTRACT: Nonuniform lossless or lossy transmission lines or layers used as broadband matching or absorbing devices are studied. When the refraction index, $n(\chi)$, and the characteristic impedance $Z_0(\chi)$, are given, the reflection spectrum, $\rho_0(\eta) = \rho_0(4\pi/\lambda)$, for $\chi = 0$ can always be computed by solving numerically a Riccati differential equation (RDE). (Analysis) Conversely, not only for n = const (Bolinder, 1950, 1956) but also for $n(\chi)$ real and $\mu = \mu_0$, a tapered transformer can be synthesized starting from a given $\rho_0(\eta)$ spectrum by using Fourier transform techniques. (Synthesis) For broadband absorbers, the synthesization procedure can be approximately applied, under certain conditions, to only the part of the spectrum which represents the reflection of the matched (lossy) line. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4823. LINDAHL, C. E., AND BARTON, B. F., "Analysis of a Detection Technique for a Spinning-Goniometer Direction-Finding System," IEEE Trans., vol. ANE-10, no. 2, pp. 124-127; June 1963. ABSTRACT: Fourier analysis is used to show that the frequency spectrum of the output voltage of the linear detector of a spinning-goniometer direction-finding receiver varies as a function of time for a cw received signal. A filter for the second detector is considered having a bandwidth which varies with time in a similar way, thus effecting a "match" between the signal and the filter. A simple s/n ratio analysis shows that an improvement in s/n ratio is possible, compared to performance of a time-invariant system. The improvement is described by the equation $I = 10 \log_{10} T/T_1$, where T is the observation time and T_1 is the basic period of the envelope of the input signal to the second detector produced by goniometer modulation. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

4824. ANONYMOUS, "Study Program Related to Shipboard Antenna System Environment," Ohio State University Research Foundation, Antenna Laboratory, Interim Report, Contract N123(953)-31663A, ASTIA No. AD-422 346; 1 June 1963. ABSTRACT: This report summarizes work completed thus far on the problems of shipboard communication systems, particularly that of rf interference. Three areas are described: (1) the study of phased arrays, low-coupled antennas, and optimum gain arrays, (2) servo-controlled nulling for interchannel interference reduction, (3) field methods for decoupled antennas. (a-1, b-3, c-1, d-1, e-0, f-Summarizing report)

4825. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Shipboard Tests of the AN/SRD-7 Three-Loop Antenna at Three Heights on the USS Haselwood," Southwest Research Institute, San Antonio, Texas, Task Summary Report Number XV, Contract No. NObsr-89167; 1 June 1963. ABSTRACT: A shipboard test of the AN/SRD-7 three-loop antenna on the USS Haselwood (DD-531) is described in detail. The antenna was tested in a nonoptimum site at three heights to determine spaced loop preformance. The e results are compared to those of the optimum site shipboard test of the same antenna on the USS Richard E. Kraus in August of 1960. Secondary objectives of the test included simple loop sense performance below 2 mc, and comparison of spaced loop and simple loop performance at the same frequencies. The test results indicate that for the highest location the spaced loop performance on the USS Haselwood was degraded by approximately 10 percent on the average when compared with previous results obtained on the USS Kraus where the distance to the foremast was approximately 40 percent greater. However, there was rapid deterioration of the spaced loop calibration curve at most frequencies as the antenna height was decreased from the maximum of 25 feet. (a-1, b-3, c-1, d-1, e-1000, f-Test report. See Abstract No. 4803)

4826. TITHERIDGE, J. E., "Large-Scale Irregularities in the Ionosphere," J. geophys. Res., vol. 68, no. 11, p. 3399; 1 June 1963. ABSTRACT: The amplitude of the 20 Mc/s signal from the satellite Explorer 7 was recorded at Auckland from November 1960 to August 1961. Variations in the fading period are used to study the irregularities that occur in the electron density of the ionosphere. Relations are given for calculating the size and density of these irregularities directly from plots of the fading period of the received signal. Results for 770 irregularities, observed at all times of day, with sizes from 5 to 500 km, are presented. The number with sizes between S and $S + \Delta S$ was approximately proportional to $\Delta S/S$. The electron content of the irregularities, measured vertically, was generally between 0.03 and 4 per cent of the total electron content of the ionosphere, with a medium value of 0.25 per cent. The density at the center of the irregularities differed from the density of the background ionization by about 1 per cent for the direction of the magnetic field, but occurred in the form of horizontal slabs with a vertical thickness equal to about one-fifth of the horizontal dimension. The fact that most irregularities larger than 50 km occurred in series of three or more similar ones suggests that they are caused by a wave of disturbance propagated through the ionosphere with a wavelength of about 100 km. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

4827. MARTIN, P. E., SHERRILL, W. M., AND TRAVERS, D. N., "The Beverage Direction Finder," Southwest Research Institute, San Antonio, Texas, Final Development Report, Contract Nr NObsr-85364; 14 June 1963. ABSTRACT: The work that has been accomplished during the ninth and last interim of contract NObsr-85364 has, of course, been extensions of some of the work already discussed in the previous eight interim reports but the major efforts were directed toward these new tasks above. Consequently, the research tasks performed over the life of the contract will be summarized as briefly as the details will allow, but emphasis will be on the results of work not heretofore reported. For those interested in a complete detailed discussion of all phases of the research program, reference should be made to interim reports five, six and seven. The preliminary work completed during the first nine months of the program is covered in detail in the fifth interim report dated 7 February 1962. During the nine-month period two arrays of Beverage antennas were constructed. One array covered 360° of azimuth with 36 antennas, each 112 meters long and uniformly spaced 10° apart. The second array covered 72° of azimuth with 42 antennas, each 300 meters long and uniformly spaced 2° apart. Tests to determine the accuracy of the indicated bearing were conducted on each array utilizing mechanical commutator switches synchronized to the display drive of a modified DAQ D/F system. The computed standard deviations for both arrays (3° to 4° for the 112 meter array; 1° for the sector array) were sufficiently good to show the feasibility of the use of the Beverage antenna in high frequency direction finding. At the conclusion of these tests, the 300 meter sector array was dismantled to permit construction of a full circular array of antennas. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4828. BIGGI, V., "Space Diversity Reception in Tropospheric Scatter Field Measurements," Compagnie Generale de Telegraphie sans fil, Paris, France, Contract No. AF 61(052)442, ASTIA No. AD-419 971; 15 June 1963. ABSTRACT: Field measurements were made over a period of one year (March 1962 to March 1963) on a swept frequency tropospheric scatter link operated at S band. The frequency transmitted is swept over a range of 200 Mc/s at a rate of 10 c/s. The receiver covers the same band in synchronisation with the transmitter. Reception is effected in space diversity by means of two antennas whose spacing is variable. Successive sweeps are received alternately on the two antennas. The results will be used in the analysis of the effect of space diversity on transmission over a wide frequency band and its dependence on meteorological conditions. (a-1, b-3, c-8, d-3, e-0, f-Observation)

4829. DUENO, B., "Interpretation of Some Sweep-Frequency Back-Scatter Echoes," J. geophys. Res., vol. 68, no 12, ASTIA No. AD-417 143; 15 June 1963. ABSTRACT: We obtain a relation for the condition of minimum time delay focusing for a spherical earth geometry assuming an ionosphere with a parabolic distribution of ion density. Theoretical curves for the case of sweep-frequency backscatter (time delay versus frequency) are obtained that agree well with experimental values. Deductions from thoory are made that explain characteristics of backscatter records. A frequency-independent constant time delay (22 msec) backscatter echo frequently observed in the south direction is explained with the help of an expression for the time delay used in deriving the minimum time delay condition. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4830. WAITKENEUS, J., TUTTLE, L., JOHNSON, L., PAPENDICK, C., AND SUGARMAN, R., "Control Techniques for Receivers in High RF Fields," American Electronic Laboratories, Colmar, Pennsylvania, RADC-TDR-63-354, Contract AF 30(602)2662, ASTIA No. AD-418 230; 29 June 1963. ABSTRACT: A number of experimental component and circuit techniques which are applicable in reducing effects of high level interference on receivers have been developed and evaluated. Areas of research included band rejection filters, helical resonators, a novel infinite skirt receiving technique, circuit control techniques and antennas techniques. The helical resonator and the circuit control techniques, which included the pass band tuner, the variable bandwidth IF amplifier and a self-synchronous blanker were designed to be compatable with the R361A communications receiver which operates over the frequency range of 225-400 Mc. The hollow, dielectric rod antenna was developed and investigated as a new approach for control of beam widths and angular location of pattern nulls. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4831. CUMMINGS, W. C., "Sector Type Shipboard High Frequency Direction Finder Antenna System," Scanwell Labs., Inc., Springfield, Va., Contract No. NObsr-81218, ASTIA No. AD-342 580; 30 June 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4832. PRIEDIGKEIT, J. H., AND ELPEL, E. A., "Position-Location Network Study," Stanford Research Institute, Quarterly Progress Report No. 11, Project 3335, Contract No. DA 36-039-sc-84966, ASTIA No. AD-347 739; 30 June 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4813)

4833. ANONYMOUS, "Weapon Direction Equipment MK 2 for (CG(N) and CG Guided Missile Ships. Task 4 Studies. Volume 1, Part 2," Sperry Gyroscope Co., Great Neck, N.Y., Report No. HB9284 0001, vol. 1, Pt. 2, Contract No. NOrd18801, ASTIA No. AD-347 505; July 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4834. ANONYMOUS, "Research and Development Summary. Vol. 10, No. 5, Section I," Army Electronics Research and Development Agency, Fort Monmouth, N.J., ASTIA No. AD-343 067, July 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4835. BURTNYK, N., MCLEISH, C. W., AND WOLFE, J., "Interferometer Direction Finder for the H.F. Band," Proc. IEE, vol. 110, no. 7, pp. 1165-1170; July 1963. ABSTRACT: The inherent accuracy of the simple two-element interferometer of several wavelengths, spacing can be utilized if resolution of the phase ambiguity is obtained. The statistical probability of this in the presence of wave interference is estimated from observations on a narrow-aperture pair of elements. The design problems and system errors are discussed for a five-element direction-finding array. (a-1, b-1, c-1, d-5, e-863, f-Experimental results)

4836. GANG, A. F., "The Active Adaptive Antenna Array System," Trans. IEEE, vol. AP-11, p. 105; July 1963. ABSTRACT: The active adaptive antenna array system (AAAAS) is a self-focusing antenna array. Phase-lock loop-type circuits are used to automatically adjust the phases of signals received on the elemental antennas of the array so that the received signals can all be added in phase or coherently. The AAAAS is active in that it automatically searches for, locks onto and tracks a source. Furthermore, the system (1) is adaptive to changes in antenna spacing, (2) is adaptive to changes in signal level and noise spectral density, (3) uses the incoming signal to automatically

and electronically collimate the antenna array beam and (4) can have its aperture amplitude distribution readily changed. A theoretical study and detailed description of two particular configurations of the AAAAS is given. The theory of operation of the system has been experimentally verified on a simulated system in which audio frequencies were used. (a-1, b-1, c-1, d-1, e-793, f-Study and description)

4837. GSCHWENDTNER, A. B., AND SWENSON, G. W., "Low Insertion-Loss, Capacitively Scanned Goniometer for Faraday Rotation Measurements in the VHF Range," Rev. Sci. Instrum., vol. 34, no. 7, p. 760; July 1963. ABSTRACT: The theory and design of a low insertion-loss electrical device to simulate a rotating dipole for Faraday rotation measurements in the frequency range 20-60 Mc is discussed. Experiment involving satellite emissions and lunar reflections are described. (a-1, b-2, c-1, d-1, e-653, f-Study and investigation)

4838. MARTIN, E. J., "Exact Expressions for the Vector Potential Produced by Circular Loop Antennas," Proc. IEEE, vol. 51, no. 7, p. 1042; July 1963. ABSTRACT: Analysis of a "Total Field" Loop Antenna. (a-4, b-1, c-1, d-1, e-0, f-Theory)

4839. MCCARTNEW, B. S., "Proposals for Electronically Scanned Circular Array," Proc. IEE, vol. 110, no. 7, pp. 1220-1222; July 1963. ABSTRACT: Describes a method whereby a circular receiving array, phased to produce a directional beam, may be electronically scanned quickly and continuously through 360°. (a-3, b-1, c-1, d-5, e-0, f-Description)

4840. OLESEN, P. K. K., AND PETERSEN, R., "Radio Direction-Finding from Coast Stations," Teleteknik, vol. 14, no. 2, pp. 51-58; July 1963. ABSTRACT: The historical development of rdf in Denmark since the Second World War is briefly reviewed. Certain fundamental principles and problems associated with the subject are discussed, and a general description is given of the cathode-ray direction-finder installation at Blovand. (a-1, b-1, c-20, d-20, e-0, f-Historical review)

4841. PIERCE, E. T., AND ARNOLD, H. R., "Sudden Ionospheric Disturbances and the Propagation of Very-Low-Frequency Radio Waves," Stanford Research Institute, Menlo Park, California, Final Report, Project 3684, Contract No. AF 49(638)1081, ASTIA No. AD-428 169; July 1963. ABSTRACT: The changes in VLF radio noise accompanying a solar flare and its associated sudden ionospheric disturbance (SID) are surveyed. The onset time of the effects is about 10 minutes, but may be less than 2 minutes for perhaps 5 percent of the incidents. The alteration in propagation conditions implies an increase in noise on frequencies exceeding 20 kc and a decrease below 10 kc. If a local thunderstorm develops, the time phasing is very similar to that of an SID incident, but noise at all frequencies is enhanced. A detailed examination of the formative processes of the lower ionosphere is made. Values of the rate coefficients for attachment, detachment (photo, collisional, and associative), electron-ion recombination, and ion-ion recombination, are deduced for heights from 40 to 100 km. The balance equations for the lower ionosphere are solved for the cases of equilibrium conditions and of the departure from equilibrium associated with the approach of night. Two specific examples indicate that contours of electron density, and therefore of ionospheric conductivity, are far from parallel to the surface of the earth. It follows that the attenuation coefficient for VLF propagation by day can differ according to the solar zenith angle by as much as 20% from the mean daytime value. (a-1, b-3, c-1, d-1, e-0, f-Sferics study)

4842. SHEARMAN, E. D. R., "Synthesis of Multi-Element Directional Patterns Using a Two-Element Single-Frequency Receiving Array," Radio electronic Engr., vol. 26, no. 1, pp. 59-66; July 1963. ABSTRACT: The principle of space-frequency equivalence has been shown elsewhere to permit synthesis of multi-element directional patterns using only two physical elements by employing a multi-frequency carrier in the transmission medium. Disadvantages of the system are the use of more spectrum space and the need for a special transmission. It is here shown that even if a single-frequency carrier only is used, multi-element receiving patterns can be synthesized from the outputs of two physical elements. By the use of frequency-multipliers at the element outputs, multi-frequency carriers are produced synthetically at the receiver. This makes possible the production by electronic methods of a wide variety of directional patterns at the receiver without the cooperation of the distant transmitter. Penalties are paid in s/n ratio and multi-source resolution relative to a physical multi-element array. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

4843. TRAVERS, D. N., "Shielded Room Transmission-Line Constant for a Coaxial Spaced-Loop Direction Finding Antenna," IEEE Trans., vol. AP-11, no. 4, pp. 507-508; July 1963. ABSTRACT: The effective height and certain near-field characteristics of a loop aerial can be determined using the transmission-line method for generating a known magnetic field inside a shielded enclosure. This method has already been used previously to obtain line constants for the simple loop aerial; it is now extended to include spaced-loop aerials. A procedure for determining an equivalent field suitable for testing a coaxial spaced loop for the effective height is described. An expression for the complete transmission line constant for a parallel opposition coaxial spaced loop is deduced. (a-1, b-1, c-1, d-1, e-1000, f-Descriptive analysis)

4844. VERTS, B. J., "Equipment and Techniques for Radio-Tracking Striped Skunks," J. Wildl. Mgmt., vol. 27, no. 3, p. 325; July 1963. ABSTRACT: The radio-tracking system described by Cochran and Lord (1963) was modified for use with striped skunks (Mephitis mephitis). A transmitter and collar were designed to fit skunks. A standardized procedure for constructing transmitters was devised and a step-by-step outline of the procedure described. A diode receiver was constructed and used to test transmitters under construction. After calibration of the meter on the diode receiver, it was possible to predict the range of the transmitters directly from output values indicated by the meter. Use of the tracking system in the field indicated that for tracking striped skunks a mobile receiver mounted in an automobile was superior to a portable receiver. Positions of animals were determined by triangulation of bearings taken from several locations. Accuracy of positions determined in this manner was about ±25 feet at 1/4 mile and about ±25 yards at 1/2 mile. In some cases, different types of skunk activity could be distinguished by means of variations in the rhythm of the received patterns of signal intensity. (a-1, b-1, c-1, d-1, e-0, f-Biotelemetry)

4845. SCHRINER, D. A., SEELEY, E. W., AND PERLE, C. N., "The Use of Sferics as a Signal Source in the Measurement of Very-Low-Frequency Antenna Patterns," Naval Ordnance Laboratory, Corona, California, NOLC 581, ASTIA No. AD-423 493; 1 July 1963. ABSTRACT: A practical method of measuring VLF antenna patterns by using sferics (the electromagnetic energy from lightning storms), has been developed. The equipment designed for the new system is designated a passive pattern plotter (PPP). The circuit includes (1) a direction-of-arrival section which measures the bearing of the sferics received by a crossed-loop antenna and (2) a comparator section, which indicates the gain of the antenna under test in relation to that of a short monopole antenna. The results are presented on oscilloscope screens, which are photographed by a 35-mm shutterless pulse camera. The photographic data are then reduced and plotted to form the antenna pattern. The information produced by the PPP results in antenna-pattern data with an accuracy of ±1.5 deg in azimuthal values and ±2db. The PPP has also proved to be a useful tool in adjusting antenna parameters to form superdirective arrays. (a-1, b-3, c-1, d-1, e-0, f-Sferics)

4846. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," Illinois University, Report No. 16, Contract No. DA 36-039-sc-87264, ASTIA No. AD-418 029; 31 July 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-508, f-Progress report. See Abstract No. 4760)

4847. EITZENBERGER, J., FISCHER, W., HARBAUER, J. K., HILLMANN, J., AND PFAFF, K., "Research in Connection with Propagation of Very Low Frequency (VLF)," Vatelle Institute, Frankfurt, Main, Contract No. DA 91(591)EUC1873, ASTIA No. AD-419 257; 31 July 1963. ABSTRACT: VLF receiving station Frankfurt/Main - receiving site; Installation of the station; and Maintenance. Development, improvement and construction of equipment - Improved slow amplitude recording device; Receiver design; NPM equipment; LF equipment; Antenna problems and construction; Noise suppression systems; Electronic system for fast phase and amplitude recording; and Time marking of recording analysis of records. (a-3, b-3, c-8, d-4, e-0, f-Research report)

4848. BREDEK, R. S., "A Method of Radiolocation Employing Around the World High Frequency Propagation," Illinois University, Urbana Engineering Experiment Station, Urbana, Illinois, Contract NOnr183402, ASTIA No. AD-420 068; August 1963. ABSTRACT: A method of radiolocation is discussed which permits obtaining a fix from measurements made at a single receiving station. The great circle distance between the transmitter and receiver is determined from the time delay between the signal transmitted via the short path to the receiver and the signal transmitter via the long path (around-the-world) to the receiver. The bearing of the signal is obtained by a Wullenweber type radio direction

finder. Results of an experiment in which signals transmitted from Stanford, California to Champaign, Illinois were studied showed that the great circle distance could be determined within 25 kilometers. The transverse distance was determined within about 50 kilometers. (a-1, b-3, c-1, d-1, e-0, f-Description)

4849. CLAPP, R. E., MAXWELL, J. C., AND COLBURN, C. H., "Study of Directive VLF Antennas for Reception of Transpolar Sferics from the Continental United States," Airtechnology Corporation, Cambridge, Massachusetts, Final Report, Project 4662, Contract No. AF 19(628)1697, ASTIA No. AD-448 341; August 1963. ABSTRACT: Directive VLF antennas were studied to determine their feasibility to receive transpolar sferics with minimal interference from sferics of tropical origin. A high front-to-back-lobe ratio and very low back lobes extending over a 120-180 degrees angular sector are required. A practicable Beverage antenna is unsuitable because of its low front-to-back ratio. The cardioid antenna null-angle is too narrow. Superdirective arrays of spaced elements (two or three) are inadequate because of insufficiently-low side lobes and the requirement for extremely tight equipment tolerances. A specialized fifteen-element endfire array using two quadrature elements at each end has been designed and in theory proved suitable for the required application; a suitable site has been recommended for its construction and demonstration; and, installation methods and costs are discussed. (a-1, b-3, c-1, d-1, e-0, f-Study)

4850. GALEJS, J., "Small Electric and Magnetic Antennas with Cores of a Lossy Dielectric," J. Res. Nat. Bur. Stand., vol. 67D, no. 4, p. 445; July-August 1963. ABSTRACT: A small loop antenna which is wound on a spherical dielectric core is compared with a cylindrical dielectric filled capacitor. Both antennas provide comparable radiation resistance and reactance for equal antenna volumes. The electric field near the loop is weaker than in the vicinity of the capacitor. This makes the efficiency of the loop less affected by the presence of a lossy dielectric core. For equal efficiencies and volumes of both antennas, the loss tangent of the dielectric in the loop antenna may be higher than that of the comparable capacitor type by a factor of at least $[\lambda/(2\pi a)]^2$ where a is the antenna radius. Practical design problems are discussed and an approximate method for estimating the losses in loop cores of arbitrary shape is presented. (a-1, b-1, c-1, d-1, e-0, f-Description)

4851. KUNZE, H., AND RATTEI, H., "Bearing Errors Dependent on Terrain and Their Prevention When Operating the VHF Adcock Direction Finders PST 476 and 589." Royal Aircraft Establishment, RAE Library Translation No. 1042, ASTIA No. AD-417 906; August 1963. ABSTRACT: In choosing VHF D/F sites, very special attention must be paid to the nature of the ground and to the surrounding terrain. This holds not only for the rotating Adcock system discussed here, but also for every other technique, even if its principles already embody means of error reduction. In considering this type of rotating Adcock D/F it should be remembered that it permits of vertical as well as horizontal direction finding, an advantage not possessed by other systems. Its easy transportability makes it particularly suitable for rapid changes of site. Erection and adjustment take only a few minutes. In difficult D/F assignments, numerous bearings can be taken in a short time from various sites and thus errors due to terrain effects can be mitigated. The error susceptibility of the installation has been illustrated by way of practical examples. If due account is taken of the nature of propagation of ultra short waves and if in the light of this, suitable D/F sites are chosen, the rotating Adcock system guarantees adequate D/F results. The table is based on many years' experience and should facilitate the users' selection of a D/F site. (a-1, b-3, c-1, d-4, e-0, f-Site determination)

4852. LIPKIN, D. M., AND PAPENDICK, C., "Two Dimensional DF Techniques," Rome Air Development Center, Project 4505, Contract No. AF 30(602)2952, ASTIA No. AD-342 733; August 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4853. SEELEY, E. W., "Optimum Reception Pattern of the Beverage Wave Antenna at Very Low Frequencies," J. Res. Nat. Bur. Stand., vol. 67D, no. 4, p. 387; July-August 1963. ABSTRACT: The theoretical reception pattern characteristics of the wave antenna at VLF, plus an experimental study of the parameters that determine the patterns are presented. Wave antennas have optimum lengths where the front-to-back ratio is greatest. The first optimum length (highest front-to-back ratio for the shortest length) is considered in this paper. The patterns of the wave antenna at these optimum lengths depend upon only two parameters which can easily be measured at the desired antenna location. These two parameters are the antenna loss and the wave velocity along the antenna. When these two parameters are known, the patterns of all first optimum length wave antennas can be sketched from the curves in this paper. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

4854. WELSBY, V. G., "The Angular Resolution of a Receiving Aperture in the Absence of Noise," J. Brit. Instn. Radio Engrs., vol. 26, pp. 115-124; August 1963. ABSTRACT: The paper is concerned with a more general approach to the problem of the performance of particular directional receiving arrays and their associated signal processing arrangements. It discusses certain physical limitations to the kind of information which can be obtained about a completely unknown far-field distribution, even if noise is assumed to be absent. It is shown, for example, that the "fineness of detail" which can be discerned by means of a given aperture is determined practically by dimensions of the aperture in the half-wave-length at a frequency corresponding to half of the total frequency bandwidth of the signal waveform. Additive processing of the outputs of the elements of a spatial array can be shown to give the best result when the field's time-stationary but unknown. More complicated processes such as multiplication and time averaging, have advantages when the field is either non-stationary in the time domain or when prior information about its form is available (e.g. knowledge that it is due to a limited number of "point" sources rather than a continuous source distribution). It is shown that, for a field at a single frequency W c/s, a multiplicative ("correlation") process provides the same fineness of detail of the far-field as that obtainable with an additive array of twice the length, provided the field has a time-stationary amplitude distribution and a relatively rapidly time-varying phase distribution. Furthermore, provided the field is of this type, comparable performance can be obtained by retaining only two receiving elements, situated at the extremities of the aperture, and using a "multi-frequency" signal waveform whose spectrum occupies a total bandwidth 2W c/s. (a-1, b-1, c-1, d-5, e-0, f-Analysis)

4855. BUIE, H. B., "An Optimized Ultra Low Frequency Shielded-Loop Antenna," Army Missile Command, Redstone Arsenal, Huntsville, Alabama, Project 1B2 22901A204, ASTIA No. AD-420 470; 1 August 1963. ABSTRACT: The design and construction are described of an optimized rectangular shielded-loop antenna employed as the receiving antenna for reception of VLF (20 kc) standard frequency broadcasts from the National Bureau of Standards, Boulder, Colorado. The receiving site is located at Redstone Arsenal, Alabama. This design affords an approximate 60 percent increase in effective height with a 3-db increase in terminal output voltage over a conventional loop antenna. The antenna will tune from 14 to 34 kc and can be optimized at any frequency within this band with the proper value of gap loading. A current bibliography of loop antenna literature is also available. (a-1, b-3, c-1, d-1, e-0, f-Description)

4856. HOMMEL, R., "Calculation of the Dipole Field Using the VLF Approximation," Innsbruck University, Innsbruck, Austria, Report No. TN5, Contract No. AF 61(052)490, ASTIA No. AD-423 437; 10 August 1963. ABSTRACT: The radiation field of a horizontal magnetic dipole at a depth h under a flat part of the earth's surface is calculated at short range by the integral method, using the VLF approximation. The field strength in the main direction of radiation is evaluated numerically and compared with the values in the case of an infinite homogenous medium. (a-1, b-3, c-8, d-16, e-0, f-Comparative analysis)

4857. DOLLE, W. C., AND CORY, W. E., "Electromagnetic-Shielding Theory and Materials," Southwest Research Institute, San Antonio, Texas; 12 August 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Theory)

4858. ANONYMOUS, "Net Controlled HF/DF Equipment," Reconnaissance Systems Laboratories, Mountain View, California, Interim Development Report, Contract NObsr-89237, ASTIA No. AD-414 450; 15 August 1963. ABSTRACT: Research concerns a program to design and fabricate 2 each of Type I, Type II, and Type III service test models of the Net Controlled HF/D/F Equipment. The equipment produced under this contract will be used with direction finder sets AN/FRD-10A(V), AN/FLR-9, and AN/GRD-6. The usefulness of the direction finder sets will be extended with the addition of the net control D/F equipment. The primary project objective is to develop an automatically tuned HF communications receiver. In addition to the receiver, several other processing and control units are included in the design requirements. (a-1, b-3, c-1, d-1, e-0, f-Project description)

4859. SHERRILL, W. M., AND TRAVERS, D. N., "A Nonrotating Spaced Loop Direction Finding System. Interim Development Report for Direction Finder Radio, Shipboard Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Contract No. NObsr-89167, Project SF0010801, ASTIA No. AD-419 161; 30 August 1963. ABSTRACT: A description and performance characteristics including bearing accuracy and system sensitivity are

given for the laboratory version of a nonrotating spaced loop D/F system. Methods contemplated for optimizing the system, including the use of antenna multicouplers, quadrature hybrids, and voltage variable inductors are discussed. Some AGC, frequency tuning, and channel matching requirements for the application of the twin channel receiver to a D/F intercept system are briefly reviewed. The results of a recent survey of twin channel receivers planned for production are summarized in terms of requirements outlined. It is concluded that the nonrotating spaced loop D/F system is a feasible and desirable system because of the capability for continuous sense and fast response time provided. Second generation twin channel receivers presently planned should offer significant intercept capability for the D/F system. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4860. ANONYMOUS, "Direction Finder Set AN/BRD-4," Servo Corporation of America, Hicksville, New York, Final Development Report, Contract NObsr-81281, ASTIA No. AD-355 335; September 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4861. GREISER, J. W., AND BROWN, G. S., "A 500:1 Scale Model of WARLA a Wide Aperture Radio Location Array," Illinois University, Engineering Experiment Station, Urbana, Illinois, Technical Report No. 2, Project No. SS024001, Contract No. NObsr-85243, ASTIA No. AD-429 235; September 1963. ABSTRACT: This report describes the design, construction, and testing of a microwave scale model of a circular array of broadband antennas. The ultimate goal of this work is the construction of a high gain direction finding array using frequency independent antennas which would permit efficient operation over the 2-32 Mc range. The scale model is an attempt to experimentally verify certain theoretical results which were obtained from calculations performed on a computer. Restrictions imposed on the array by the necessity of keeping inter-element phase center spacings less than approximately .75 wavelengths have forced the use of three sets of log-periodic elements - one set being added for each higher frequency band. The model discussed here represents only the lowest frequency band of the full array. A scaled frequency range of 1000 to 2500 Mc (array diameter of 29 in.) which corresponded to the 2-5 Mc range (array diameter of 1210 ft.) was empl yed as the model frequency limits. Typical radiation patterns of the mode! are presented and their relation to computed patterns are discussed. (a-1, b-3, c-1, d-1, e-0, f-Description)

4862. LO, Y. T., "On the Antenna Noise and Its Minimization," University of Illinois, Electrical Engineering Laboratory, Technical Report No. 74, Contract No. AF 33(657)10474; September 1963. ABSTRACT: In this investigation a method of estimating various antenna noises is discussed. In the general case when noise sources are in the near field of the antenna the problem becomes exceedingly difficult. For this only a high frequency approximation is suggested; it is similar to the general scattering theory of perfectly conducting scatterers. For a given antenna and a given noise temperature distribution in space, an optimum aperture distribution, discrete or continuous, can be obtained by maximizing the signal to noise ratio with a reasonable value of the antenna Q-factor. The solution to this problem is reduced to that of an eigen-value of a matrix equation. As an example, the antenna noise temperature of the University of Illinois Radio Telescope is approximately determined by the method discussed in Section 2. (a-1, b-3, c-1, d-1, e-767, f-Noise analysis)

4863. MILSTEAD, J. B., "LF and VLF Antennas," Defense Documentation Center, Alexandria, Va., ASTIA No. AD-341 866; September 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4864. MORRIS, D. W., MITCHELL, G., MAY, E. J. P., HUGHES, C. J., AND DALGLEISH, D. I., "An Experimental Multiple-Direction Universally Steerable Aerial System for H.F. Reception," Proc. IEE, vol. 110, no. 9, pp. 1569-1582; September 1963. ABSTRACT: An earlier paper presented briefly the principles under-lying a proposal for an hf directional aerial system, steerable in both azimuth and elevation, which comprised an array of omnidirectional unit aerials whose outputs for any given received signal could be brought approximately into phase by wideband phaseshift networks switched under the control of a special-purpose computer. An experimental system based on these principles has been constructed. The design factors involved are discussed in the present paper which shows that the performance that can be realized in a practical system approximates to the theoretically achievable performance. The application of the technique to the synthetic design of aerial systems is discussed briefly. (a-1, b-1, c-1, d-5, e-0, f-Description)

4865. PETERS, L., AND RUDDUCK, R. C., "Application of Electromagnetic Absorbing Materials as Interference Reduction Techniques," Ohio State University, Research Foundation, Columbus, Ohio, RADC-TDR-63-391, Contract No. AF 30(602)2711, ASTIA No. AD-419 496; September 1963. ABSTRACT: The calculation of radiation patterns of thick-walled horns is being undertaken for the purpose of RFI reduction studies. The solution for diffraction of a cylindrical wave by a wedge is obtained. This result is used to calculate diffraction by a thick edge. The previous technique for finding diffracted fields from thick edges yields large errors over a wide region of space in the vicinity of the shadow boundary. The technique developed here yields valid results in these regions. Patterns calculated by this revised technique are found to agree well with measured patterns of a thick-walled horn. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4866. WAIT, J. R., AND ISLAM, M. A., "Comments on 'A Theoretical Treatment of Low-Frequency Loop Antenna with Permeable Cores'," Trans. IEEE, vol. AP-11, no. 5, p. 592; September 1963. ABSTRACT: The result given previously is said to be incorrect because coupling between different ordered modes has been neglected. In his reply Islam agrees that this is so, but claims that the error is very small, given the conditions assumed in his paper. (a-3, b-2, c-1, d-1, d-0, f-See Abstract No. 4786, dated March 1963 by Islam)

4867. ANONYMOUS, "Research on the Application of the Luneberg Lens to ECM Antenna Systems," Ohio State University, Research Foundation Antenna Lab., Columbus, Ohio, Report No. 139410, Project No. 6378, Contract No. AF 33(657)7829, ASTIA No. AD-422 051; 1 September 1963. ABSTRACT: The multiple beam capability of geodesic lens antennas is being investigated. The narrow flush feeds which are tested on a lens model preclude mechanical blocking in the lens and provide close overlap of adjacent beams. The influence of adjacent feeds on the radiation patterns and the gain of the lens is measured. The radiation patterns of a lens antenna depend on the element pattern of the lens aperture. A method for calculation of the element pattern is described in which the geometrical theory of diffraction is used to determine diffraction from the edges of the lens plates. (a-1, b-3, c-1, d-1, e-0, f-Description)

4868. D'AMBRISI, A., AND CECIL, J., JR., "Design and Development of Antenna Group for Direction Finder Sets AN/PRD-7 and AN/PRD-8," American Electronic Labs., Inc., Colmar, Pa., Report No. 6 (Final), Contract No. DA 36-039-sc-84981, ASTIA Nos. AD-425 688 and 437 876; 5 September 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4869. ANONYMOUS, "Net Controlled HF/DF Equipment," Reconnaissance Systems Lab., Mountain View, California, Report No. 63R66, Project SS024001, Contract No. NObsr-89237, ASTIA No. AD-417 670; 15 September 1963. ABSTRACT: A discussion of the engineering activity of the COMINT receiver and the automatic azimuth indicator of the Net Controlled HF/DF Equipment. The discussion on the receiver is concerned with the problems encountered in the use of reed relays as an RF switching device and technical considerations in the design of the IF amplifiers. Seizure and sticking difficulties were encountered in using reed relays as an RF switching device. These difficulties were attributed to poor capsule manufacturing and improper circuit application. These problems have been resolved, thereby assuring the desired circuit function. Vacuum tube IF amplifiers were decided on instead of transistor IF amplifiers because of design cost and design time considerations. Obtaining the necessary wide bandwidth and high gain, low noise, and AGC range were special considerations in the design of the IF amplifiers and are briefly discussed. It has been determined that after extensive electrical and mechanical modifications, certain circuits (printed circuit boards) in the AN/FRD-10 azimuth indicator will be interchangeable with those used in other direction sets. A study was undertaken to optimize the deflection amplifiers used in the AN/FRD-10 azimuth indicator. Of primary importance in an amplifier of this type are power dissipations. This report gives the mathematical analysis of this circuit. (a-1, b-3, c-1, d-1, e-0, f-Discussion. See Abstract No. 4858)

4870. MIKHAYLOVA, G. A., AND KURAKINA, T. I., "Phase Velocity of Electromagnetic Waves in the Range 1--25 KCPS," Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio, ASTIA No. AD-422 578; 20 September 1963. ABSTRACT: The average phase velocity of electromagnetic waves in the range 1--25 kcps have been obtained through harmonic analysis of radio disturbances recorded simultaneously in Moscow and Leningrad in the daytime from distances r > 1,000 km. The character of the dependence of v/c on the frequency obtained by a method which excludes the source of the signals coincides with the results of preceding projects which take into consideration a standard source. The absolute value v/c within the limits of the precision of the measurements also agrees well. At the frequencies

f > 5 kcps the experimental values of v/c, with a precision up to 0.5% coincide with the theoretical ones computed for a plane model of the ionosphere. (a-1, b-3, c-1, d-1, e-0, f-Theory)

4871. TRAVERS, D. N., AND MARTIN, P. E., "Circular Arrays of Beverage Antennas for High Frequency Direction Finding," Southwest Research Institute, San Antonio, Texas, Project SF0010805, Contract No. NObsr-89345, Interim Report No. 1, ASTIA No. AD-417 897; 23 September 1963. ABSTRACT: Modification of the AN/FRD-10 channel watcher as a D/F receiver and indicator for use with a Beverage array and a 180 input diode commutator is now 100 per cent complete. Plans were initiated in July to make bearing studies on the 112 meter Beverage array (112 meter long antennas spaced 2 degrees), however, a requirement to use the commutating system for specialized tests outside the United States necessitated postponement of these data. Bearing studies will be resumed as soon as the equipment is returned to Southwest Research Institute. Analysis of results obtained on the crossed-over array indicate that experimental investigation of a crossover design may be conveniently carried out at the 112 meter site which now consists of noncrossed-over antennas. This investigation will be concerned with methods of isolation for frequencies above 10 mc in the crossover region. Equations have been derived and programmed for the Institute's digital computer to calculate both azimuth and elevation patterns for various circular sector arrays of Beverage antennas. This program is ready for use and patterns will be completed during the coming interim period. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4872. EKLUND, F., "The Troposphere as the Factor Limiting Accuracy in the Measurements of Distances and Directions by Radio Methods," Elektroteknisk Tidsskrift, vol. 76, no. 24, pp. 413-420; 25 September 1963. ABSTRACT: In precision measurement of distance and direction by radio methods the measured result is influenced by the troposphere, a dielectric variable in time and space. The magnitude of the measurement errors caused by the influence of the troposphere upon the transmission of radio waves is discussed, also various methods of correction designed to reduce these errors. Accuracies of the order of ±5 to ±10 cm may be achieved for distances of 10 to 30 kilometres. For great distances the accuracy is reduced to the order of ± a few metres. Determination of the azimuth angle is the most difficult problem in the measurement of direction. At small angles of elevation and distances less than 10 to 20 km it appears possible to achieve an accuracy of the order of $\pm 10^{-2}$ milliradians (±2 seconds of arc). In this case the accuracy also falls rapidly as distance is increased so that at great distances it is reduced to about ±1 milliradian (±3 minutes of arc). (a-2, b-1, c-21, d-21, e-0, f-Propagation study)

4873. MARTIN, P. E., TRAVERS, D. N., AND CASTLES, M. P., "An Experimental Beverage Antenna Array for Land Based Direction Finding between 1.5 and 30 Mc," Southwest Research Institute, San Antonio, Texas, Quarterly Progress Report No. 1, Project No. 13866, Contract No. DA 36-039-AMC-02346(E), ASTIA No. AD-425 157; 30 September 1963. ABSTRACT: The primary efforts during the first quarter of the contract have been devoted to the acquisition of experimental data for single wire Beverage antennas of dimensions consistent with contract objectives. Treatment of the single Beverage antenna as a transmission line has made it possible to obtain data for the calculation of line constants for antenna heights of one and two meters. Effective height measurements have also been initiated, with experimental data obtained for antenna lengths of 300 and 412 meters, and heights of one, two and three meters. A theoretical effective height study has considered antenna lengths of 112, 187, 300 and 412 meters and heights of 0.7, 1, 2, 4, and 7 meters. Agreement is satisfactory, and it is believed the theoretical calculations may be used with confidence. A theoretical pattern study for both azimuth and elevation planes for 300-meter antennas is under way. The D/F site for a circular 300-meter array has been cleared and antenna locations have been surveyed. An investigation of RF gates for a D/F commutator is being conducted to seek a device with an output relatively free of control signal transients. Three solid state circuits are being experimentally tested. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4874. BRITTNER, B. J., "Current Discontinuity Devices," 13 Annual Symposium on USAF Antenna Research and Development Program, October 1963, at University of Illinois, Sponsored by Wright Air Development Division, Wright-Patterson AFB, Ohio; October 1963. ABSTRACT: The concept of flux linkage coupling between transmission elements is very mature and well understood. Therefore the extrapolation process to the new class of components discussed in this summary report should have been accomplished 25 years ago! As a result, the "inventive-process" which produced the filters, wave traps and new antenna configurations is probably more startling in its basic simplicity. This simplicity has proven to extend to the prototype and final products and generally has produced design objectives with a minimum of research and development effort. Discussion of some current discontinuity aspects will be limited due to licensing restrictions. (a-1, b-3, c-1, d-1, e-0, f-Survey)

4875. BALL, C. O., DESIZE, L. K., MCINNES, P. A., SKAHILL, G. E., AND WILSON, C. J., "VLF Antenna Techniques," Airborne Instruments Lab., Inc., Deer Park, N.Y., Report No. 209012, Project No. 5582, Contract No. AF 30(602)2794, ASTIA No. AD-344 822; October 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4876. GREISER, J. W., AND BROWN, G. S., "A 500:1 Scale Model of WARLA - A Wide Aperture Radio Location Array," 13 Annual Symposium of USAF Antenna Research and Development Program, October 1963 at University of Illinois, Sponsored by Wright Air Development Division, Wright-Patterson AFB, Ohio; October 1963. ABSTRACT: This paper describes the design, construction, and testing of a microwave scale model of a circular array of broadband antennas. The ultimate goal of this work is the construction of a high gain direction finding array using frequency independent antennas which would permit efficient operation over the 2.32 Mc range. The scale model is an attempt to experimentally verify certain theoretical results which were obtained from calculations performed on a computer. Restrictions imposed on the array by the necessity of keeping interelement phase center spacings less than approximately .75 wavelengths have forced the use of three sets of log-periodic elements - one set being added for each higher frequency band. The model discussed here represents only the lowest frequency band of the full array. A scaled frequency range of 1000 to 2300 Mc (array diameter of 29 in.) which corresponded to the 2-5 Mc range (array diameter of 1210 ft.) was employed as the model frequency limits. Typical radiation patterns of the model are presented and their relation to computed patterns are discussed. (a-1, b-3, c-1, d-1, e-0, f-Description)

4877. HUGHES, C. J., AND MORRIS, D. W., "Phase Characteristics of H.F. Radio Waves Received after Propagation by the Ionosphere," Proc. IEE, vol. 110, no. 10, pp. 1720-1734; October 1963. ABSTRACT: A radio wave after reflection from the ionosphere is considered to consist of a specularly reflected component plus a varying diffracted component. The ratio of the power in the specular component to that in the diffracted component is of interest in considering the design and performance of large-aperture receiving arrays. A theoretical treatment is presented whereby this ratio can be derived from the probability distribution of the phase difference between the signals received at two widely spaced aerials. Apparatus for the determination of the phase-difference distribution is described, and the experimental technique developed for using the apparatus is discussed. The results of measurements made on typical hf transmissions are presented and discussed in relation to known ionospheric phenomena. Consideration is also given to the use of the techniques for the determination of the vertical arrival angle and the angular spread of the cone of radiation of a received signal. (a-3, b-2, c-1, d-5, e-0, f-Study and investigation)

4878. MEDLIN, N. F., "Direction Aerials for M.F. Broadcasting," Proc. IRE, Australia, vol. 24, no. 10, pp. 734-748; October 1963. ABSTRACT: The subject of directional aerials is introduced after a general discussion of the problems associated with the efficient use of the channels in the medium frequency broadcasting band (525 kc/s-1065 Kc/s). Two practical examples of the design of two-element directional aerial systems are given, in which overall directional characteristics are calculated and for which individual theoretical matching network and feeder system characteristics and component values are determined. The methods used to obtain this information have proved remarkably accurate in practice. Procedures for adjusting directional systems follow, including the derivation of practical figures for the individual radiator and mutual impedances. These measured values may be substituted for those assumed in the preliminary theoretical investigations and working values obtained for the components of the various networks. Finally, preferred methods for proving the field pattern are described together with details of the monitoring equipment considered necessary for its satisfactory maintenance. (a-2, b-1, c-1, d-11, e-0, f-Survey and discussion)

4879. PROCOPIO, L. W., KASHIHARA, T. K., CZORPITA, S., ABEND, K., AND LENAHAN, T. A., "Advanced Antenna Techniques," Philco Scientific Laboratory, Blue Bell, Pennsylvania, Contract No. AF 19(628)2403, Prepared for Air Force Cambridge Research Laboratories, Office of Aerospace Research, United States Air Force, Bedford, Massachusetts; October 1963. ABSTRACT: A generalized theory of resolution for linear array antennas is presented. The theory indicates that angular resolution is determined by the width of the autocorrelation of the field pattern and not by the width of the pattern itself.

Hence a well defined main beam is not a prerequisite for achieving angular resolution, even noiselike beams can be characterized by an autocorrelation function of narrow width. It is shown that this basic principle leads to the concept of angular dispersion and compression, a phenomenon for angular beam patterns akin to dispersion and compression of radar pulses. A new procedure for synthesizing antennas for given resolution properties is also presented. The theory is applied to antennas with time-invariant and time-varying illumination functions, and is used to re-examine classical theories of superdirectivity. Antennas which intimately link resolution properties in range and angle are also analyzed; arrays in which each radiator operates at a different frequency are shown to be an example of this class. In addition to an exposition of angular resolutions theory, preliminary concepts for achieving angular dispersion and compression, and superdirectivity are also presented. (a-1, b-3, c-1, d-1, e-713, f-Theory)

4880. SEELEY, E. W., "V.L.F. Superdirective Loop Arrays," J. Res. Nat. Bur. Stand., vol. 67D, no. 5, pp. 563-565; September-October 1963. ABSTRACT: Superdirectivity may be achieved with short vlf loop arrays because the beamwidth depends only upon the number of loops and not the length of the array. In addition the usual factors limiting superdirectivity are not so prevalent due to the decoupling between vlf loops. Expressions are derived for the beamwidth, effective height, reception pattern, amplitude and position of the back lobes and the effects of loop voltage phase and amplitude differences between loops for short arrays of any number of loops. The most serious limitations on the directivity of these arrays are the voltage phase and amplitude differences between loops. These differences add to obscure the nulls and deteriorate the reception pattern. (a-2, b-1, c-1, d-1, e-0, f-See Abstract No. 4801 for similar topic by same author)

4881. TAYLOR, W. L., "Radiation Field Characteristics of Lightning Discharges in the Band 1 kc/s to 100 kc/s," J. Res. Nat. Bur. Stand., vol. 67D, no. 5, p. 539; September-October 1963. ABSTRACT: The groundwave portion of atmospheric waveforms was examined to determine various characteristics of the radiation field from lightning discharges. Sixty-nine representative waveforms were selected from 1,029 atmospherics from 21 thunderstorms in the Oklahoma and North Texas area. The average amplitude and phase spectra, from 1 kc/s to 100 kc/s, are presented for several groups of atmospherics having distinguishable characteristics. Various relationships involving the total radiated energy, peak field strength, first half cycle length, spectral amplitude peak and frequency of spectra peak are presented. The "normal" type of atmospheric, composing 86 percent of the total, is predominately of positive initial polarity, has a spectrum peak near 5 kc/s and has well defined relationships between the parameters mentioned above. All "other" types of atmospherics are predominately of negative initial polarity, have a spectrum peak from less than 1 kc/s to 18 kc/s and have no well defined relationships between the various parameters. (a-1, b-1, c-1, d-1, e-0, f-Sferics)

4882. WADE, H. D., "Input Impedance and Radiation Efficiency Characteristics of VLF Trailing-Wire Antennas and VLF Side-Loaded Transmission-Line Antennas," New Mexico University, Albuquerque, Report No. TR EE100, Contract No. Nonr 279801, ASTIA No. AD-423 420; October 1963. ABSTRACT: Presented is a comparison in free space of input impedance and radiation efficiency characteristics of two types of radiating structures which have been proposed for use as airborne VLF antennas: Namely, the single "trailing-wire antenna" and the side-loaded "transmission-line antenna." From the theory of side-loaded transmission-line antennas derived by R.W. Kulterman, input impedance, radiation efficiency, and side-loaded voltage drops are calculated for examples of three types of transmission-line antennas. Some general comparisons are made between the efficiency and impedance characteristics of training-wire antennas and transmission-line antennas. Some advantages and disadvantages of both types of antennas are given. (a-1, b-3, c-1, d-1, e-0, f-Analysis and comparison)

4883. WHITEHEAD, J. D., AND MALEK, A., "A Suggested Method of Accurately Measuring the Virtual Height of Reflection of Radio Waves from the Ionosphere," J. atmos. terrest. Phys., vol. 25, p. 599; October 1963. ABSTRACT: Two methods of measuring the virtual height of the ionosphere have been widely used. The first, due to Appleton and Barnett (1925), involves measuring the relative phase change between ground and sky waves of CW radio waves as the frequency is slowly changed. If ϕ is the relative phase, and h_f' the virtual height minus half the distance between transmitter and receiver, we have

$$\frac{d\phi}{df} = -\frac{4\pi h_f'}{c},$$

whence h_f' may be determined. However this method does not work well when multiple, split or spread echoes are present. This is why the second method, that of Breit and Tuve (1926) is the more generally used. In this method, the time delay between a transmitted pulse of radio waves and its echo from the ionosphere gives a direct measure of the virtual height. In a typical modern system, the pulse length may be 50 μsec, its peak power 10 kW, receiver bandwidth 20 kc/s and the accuracy of the virtual height measurement is to a few kilometers, being limited by the length of the pulse and related bandwidth. To achieve a more precise measurement, a shorter pulse, and correspondingly wider receiver bandwidth may be used. If the noise were random, the mean power transmitted would have to remain constant to keep the signal to noise radio constant; therefore the peak power has to be inversely proportional to the pulse length. Thus a 1 μsec pulse would require a peak power of 500 kW, which in practice is expensive to obtain. The situation is usually worse than this because many ionospheric stations are close to powerful local transmitters and the receiver bandwidth must be sufficiently narrow to fit into the frequency gaps between these transmitters. Bandwidths much in excess of 20 kc/s are often unsuitable. The purpose of this note is to describe a method of measuring virtual height which retains the advantages of both systems. 50 μsec pulses of reasonable peak power, and corresponding receiver bandwidth, allow separation of multiple and split echoes; the radio frequency is swept over about a 1 Mc/s range, and the phase of the echo is recorded. Thus all the information one would have in transmitting a 1 μsec pulse is retained. The phase of the echo using a pulse transmission is found by using as reference a CW oscillator, locked in phase to the transmitted pulse (Findlay 1951). Between each transmitted pulse (after the echo has returned) the frequency of the CW oscillator, which is well defined, is increased by Δf, which may conveniently be 15 kc/s. At the same time, the transmitted frequency is increased by Δf. To achieve the accuracy required and assumed in the calculations below, it is sufficient if the CW oscillator never departs by more than a radian in phase from its correct frequency, until after the echo returns. Technically, this should not prove too difficult. (a-1, b-1, c-1, d-5, e-0, f-Measurements - Ionosphere)

4884. JOHNSON, E. C., "Project TACAMO Investigation of Very-Low-Frequency (VLF) Propagation," Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa., Phase Report, ASTIA No. AD-344 439; 11 October 1963. ABSTRACT. Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4885. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products, Inc., Mountain View, California, Report No. 63R76, Project SS024001, Contract No. NObsr-89237, ASTIA No. AD-422 184; 15 October 1963. ABSTRACT: Research was continued on the design and development of service test models of net controlled HF/DF equipment. The equipment will be used to increase the operational capabilities of direction finder sets AN/FRD-10A(V), AN/FLR-9, and AN/GRD-6. The primary project objective is the development of an automatically tuned HF communications receiver. Conventional reed relay designs used in an RF switching application were unsatisfactory because when used in conjunction with a high Q circuit, the Q is reduced approximately 80%. This problem was resolved by plating the reed contacts and changing the fundamental reed material. The design considerations and problems encountered in the procurement of the 1-kc, 3-kc, 6-kc, 12-kc, and 200-cps RF receiver bandwidth filters is discussed. The design specifications are listed for review. The design approaches and considerations of various stages (i.e., mixers, multipliers, dividers, etc) in the RF tuning control are discussed. An overall block diagram of the RF tuning control is provided and each stage discussed is supported by a schematic or block diagram. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4869)

4886. DINGER, H. E., AND GARNER, W. E., "Whistler Observations in Connection with Nuclear Explosions," J. geophys. Res., vol. 68, no. 20, pp. 5641-5648; 15 October 1963. ABSTRACT: During part of the 'Plumbbob' series of nuclear explosions at the Nevada testing grounds in September 1957, whistler recording equipment was installed and operated near Fallon, Nevada, about 260 miles north of the explosion area. Whistlers were obtained that proved to be two-hop whistlers originating in electromagnetic pulses associated with the explosions. It is shown that the possibility of a naturally-excited whistler (from lightning) occurring at the exactly correct times in each case is extremely small. The electromagnetic pulses from the explosion was recorded simultaneously on the whistler recorder in Nevada and on sferic direction-finding equipment near Washington, D.C. (a-3, b-2, c-1, d-1, e-0, f-Observation)

4887. TURNER, A. G., "Feasibility Study on an Airborne L-Band and UHF Omnidirectional Antenna," General Dynamics, Fort Worth, Texas, Report No. FZE227, ASTIA No. AD-424 385; 25 October 1963. ABSTRACT: A description of a feasibility study and limited development work accomplished by GD/FW on an Airborne L-band and UHF Omnidirectional Combination Antenna are presented. The study and work are

exemplary of the fact that it is desirable to combine as many functions into an aerodynamic blade antenna as possible during the development of a high-speed fighter airplane. The main objective in this study has been to determine the feasibility of developing a combination L-band and UHF antenna which will provide omnidirectional radiation pattern coverage that will meet the specifications in MIL-A-6224 for UHF and MIL-A-25730 for L-band. Since the L-band antenna is incorporated in the envelope of a UHF blade antenna, the feasibility study has been limited to the development of an L-band antenna with the desired radiation pattern characteristics. (a-1, b-3, c-1, d-1, e-0, f-Description)

4888. BRADY, A. H., "On the Long Term Phase Stability of the 19.8 Kc/s Signal Transmitted from Hawaii, and Received at Boulder, Colorado," Central Radio Propagation Lab., National Bureau of Standards, Report No. P68D3 343, ASTIA No. AD-435 897; 31 October 1963. ABSTRACT: The use of VLF signals for intercontinental frequency comparison is now popular, and it was shown that a precision of about 2 parts in 10 to the 11th can be achieved with measurements over a 24-hr period. Phase records made at Boulder, Colo., of the NPM, Hawaii, 18.6 kc/s transmission have been studied for several periods of nearly two weeks duration in 1962. Deviations from an assumed linear frequency difference between the transmitter and receiver oscillators show an attainable precision of 2.5 parts in 10 to the 11th in a 24-hr observation, extending to 3.1 parts in 10 to the 12th in a 192-hr observation. Without further data on the remaining differences between the oscillators, there is no evidence that the propagation conditions over the path are limiting this precision. The 50 semiannual variation in the day to night change in phase, if attributed entirely to one level of reflection, would effect precision of frequency comparison of about 1 part in 10 to the 12th. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4889. ANONYMOUS, "Operational Test and Evaluation AN/GRD-11 Direction Finder Set," Air Force Communication Services, Scott AFB, Illinois, ASTIA No. AD-424 738; November 1963. ABSTRACT: An operational test and evaluation of the modified AN/GRD-11, UHF Direction Finder, was conducted at Dobbins AFB, Georgia, between 1-30 September 63. The purpose of the test was to determine operational suitability following modifications and appropriate status classification of the equipment in accordance with AFR 80-6. This test was a follow-on to operational tests conducted at Langley and Dobbins AFB's between May and August 62, which indicated a need for modifications prior to acceptance as an operational facility. Evaluation of the test results indicates the modified equipment is operationally suitable with exception of the large indicator size which prohibits installation in control tower consoles. The status classification of Limited Standard is considered appropriate. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

4890. BUCK, R. H., AND FRANCESCHINI, J. B., "The Design, Fabrication and Installation of a Wire-Grid Lens for HF Radio Direction Finding," TRG-West, Division of TRG, Inc., Menlo Park, California, Project No. 4505, Contract No. AF 30(602)3110, ASTIA No. AD-425 404; November 1963. ABSTRACT: Presented is the hardware development stage of an over-all effort directed to the application of the wire-grid lens to HF direction-finding. Fundamental design information from previous studies is available in the form of computer programs and files. Use of this data has permitted determination of all dimensions of a lens which will operate in the 10-50 Mc range having beamwidths suitable for direction-finder application. A wire-grid lens, by reason of its circular symmetry, will form a beam diametrically opposite the peripheral location of any properly designed feed. By placing 36 feeds at 10-degree intervals around the perimeter of the lens and suitably sampling adjacent pairs of feeds, azimuthal direction information is obtained on incoming radiation. Signals from adjacent feeds are compared in both phase and amplitude such that sum and difference signals can then be used to generate direction-finding information. Projected accuracy in the scanning mode is expected to be better than one degree. The scanning rate is intended to range from 0.1 to 1,000 revolutions per second. Based upon progress achieved to date, as related to the plan for achievement, it is concluded that the over-all program will experience no major difficulties in meeting its required goals. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4898 for parallel project work)

4891. GREENE, C. R., "Directional Properties of Under-Ice Ambient Acoustic Noise," Naval Ordnance Laboratories, White Oak, Maryland, NOL TR63 164, ASTIA No. AD-420 335; November 1963. ABSTRACT: The outputs of a pair of hydrophones suspended beneath the ice and separated sometimes vertically (210 feet) and sometimes horizontally (359 feet) were tape recorded. In order to measure directional properties of the ambient noise so recorded, the tapes were analyzed using polarity coincidence crosscorrelation. The results showed low frequency correlation as high as 34 percent and some high-frequency correlation, probably resulting from marine life and strumming antenna wires in camp, as high as 6 percent. The correlation was generally stable over a period of minutes and often hours. Selected correlation functions are shown. (a-1, b-3, c-1, d-1, e-0, f-Experiment and analysis)

4892. MOODY, H. J., "A Survey of Array Theory and Techniques," RCA Victor Co., Ltd., Canada, Report No. 6-501-3, Subcontract to Northern Electric Co., Ltd., ASTIA No. AD-430 028; November 1963. ABSTRACT: A survey of antenna array theory and techniques is presented. A geometrical interpretation is presented which is slightly different from that used by other authors and adapts readily to frequency scanned arrays. Six scanning techniques are discussed in some detail and a number of planar array antennas are presented which combine one or two of the scanning techniques for scanning in the two orthogonal directions. An analysis of sytematic errors due to beam distortions with scanning angle is presented. These errors are shown to be non-existant in 1/wavelength cos alpha space if the beams all overlap at the same amplitude and can be made negligibly small even for a frequency scanned array when the beams are separated by equal frequency increments. The effects of random errors on gain and side lobe level are discussed and a simplified diagram of side lobe level as a function of RMS random error is presented. (a-1, b-3, c-1, d-7, e-0, f-Survey)

4893. ANONYMOUS, "QRC-158-1(T) Production Antenna," Adams-Russell Co., Inc., Cambridge, Mass., Report No. D293, Contract No. AF 33(604)40137, ASTIA No. AD-345 141; 19 November 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4894. ANONYMOUS, "Very-Low-Frequency Propagation Research," Sylvania Electric Products, Inc., Waltham, Mass., Final Report No. 2, Report No. FO154-2, Project NR371 650, Contract No. Nonr-318500, ASTIA No. AD-348 726; 30 November 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4895. ANONYMOUS, "Position Determining Measurements Using Time Difference Techniques," ITT Federal Labs., Nutley, New Jersey, Interim Engineering Report No. 22, Contract No. NObsr-77558, ASTIA No. AD-346 118; 30 November 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4896. ANONYMOUS, "Two Dimensional DF Techniques," American Electronic Labs., Inc., Colmar, Pennsylvania, Quarterly Report No. 2, Project 4505, Contract AF 30(602)2952, ASTIA No. AD-346 580; December 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4897. ANONYMOUS, "VOR Dual-Sideband Equipment," Collins Radio Co., Cedar Rapids, Iowa, Final Report, ASTIA No. AD-432 709; December 1963. ABSTRACT: The FAA/BRD-404 Dual-Sideband Doppler VOR system consists of a dual-sideband VHF transmitter and dual-rotor distributor developed for use with the FAA Doppler VOR ground station. The dual-sideband transmitter consists of a sideband generator frequency and phase locked to a carrier transmitter, sideband amplifiers, and power amplifiers. The output of the sideband transmitter is 100 watts per sideband. The dual-rotor distributor is a capacity type distributor which switches the two sideband inputs to 50 antenna outputs. The sideband inputs are fed simultaneously to opposite antenna outputs. Opposite sideband suppression is 30 db and carrier suppression is 40 db at the output. Adjacent antenna output isolation is 30 db and isolation to the remaining antenna outputs are 50 db or more. The use of a dual-sideband system in the Doppler VOR ground system is possible and should show improvement over a single sideband system. (a-1, b-3, c-1, d-1, e-0, f-Description)

4898. ANDREASEN, M. G., SHARP, E. D., AND GREENE, J. C., "An Investigation of the HF Wire-Grid Lens Antenna for Direction Finding," Rome Air Development Center, Griffiss AFB, New York, Report No. RADC-TDR-63-211, Project No. 4504, Task No. 450502, ASTIA No. AD-296 364, NASA No. N64-14327; December 1963. ABSTRACT: This is the final Technical Documentary Report on Contract AF 30(602)2742, FSC-0082, which has as its purpose the theoretical investigation of the HF Wire-Grid Lens Antenna for use as an HF direction-finding antenna. In Technical Documentary Report 1, the refractive index of double-square wire-mesh grids was calculated and a ray-tracing technique developed for synthesizing a lens having a prescribed refractive index in an annular region. Technical Documentary Report 2 described a feed for exciting the wire-grid lens, called a "ramp feed," which is electrically equivalent to an end-fire array of electric dipoles. Using ray-tracing techniques, radiation patterns of

the wire-grid-lens radiating into a matched transmission line region are calculated when it is excited by a ramp feed. In Technical Documentary Report 3, the properties of the HF Wire-Grid Lens Antenna as a direction finder were investigated when it is operated in the monopulse, amplitude-comparison, and phase-comparison modes. In this final Technical Documentary Report an electromagnetic solution of the radiation characteristics of the HF Wire Grid Lens Antenna is outlined. This electromagnetic solution yields accurate radiation patterns for lenses having any diameter-to-wavelength ratio. This solution also includes the effect on the radiation pattern of the flared horn surrounding an actual wire-grid lens, both for the case when the horn surfaces are constructed of isotropic metal conductors, and for the case where the horn surfaces are constructed from radial wires. The validity of the lens solution has been tested against results obtained by H. Jasik for the special case of a Luneburg Lens. (a-1, b-3, c-1, d-1, e-658, f-See Abstract No. 4096)

4899. CARPENTER, G. B., "An FM Technique for Observation of VLF Whistler-Mode Propagation," Stanford Electronic Labs., Stanford University, Menlo Park, California, Contract No. Nonr-22527, ASTIA No. AD-429 891; December 1963. ABSTRACT: Natural whistlers and signals from VLF transmitters were employed in studying whistler-mode propagation. The usefulness of whistler is restricted by the relative lack of information concerning lightning-scource parameters, while relatively poor multipath resolution was obtained using the signals of VLF transmitters. A controlled-source experiment intended to overcome these disadvantages is described. When a VLF transmitter is frequency modulated, high resolution of multipath signals is theoretically possible. The FM technique for detecting and resolving whistler-mode signals is based on the observation of amplitude modulation of the direct subionospheric signals due to the presence of whistler-mode signals. Travel time of the whistler-mode signal is associated with the periodicity of the envelope changes of the composite signal. Factors such as signal dispersion, value of modulation parameters, and instrumental effects are considered with regard to their influence on detection and resolution. An actual FM experiment was conducted employing transmissions from NPG (18.6 kc) at Jim Creek, Washington. (a-1, b-3, c-1, d-1, e-0, f-Sferic study)

4900. DYSON, J. D., "Measurement of the Phase Centers of Antennas," University of Illinois, Electrical Engineering Laboratory, Technical Report No. 66, Contract No. AF 33(657)10474; December 1963. ABSTRACT: There are many antennas, including the log-periodic and log-spiral antennas, that do not have a unique phase center. For these antennas an "apparent phase center" is defined over a limited range of space surrounding the antenna. A measurement technique has been developed that will permit automatic plotting of modified phase patterns from which the effective position of this "apparent phase center" may be determined. This technique requires the use of only standard antenna pattern recording equipment and a detector which is sensitive to the amplitude and to the phase of the radiated field of the particular antenna under consideration. Deviation of these patterns from a unit circle on a polar plot or straight line on a rectangular plot (or as a modification, from the amplitude pattern) may be interpreted from curves supplied, to show the position of the phase center with respect to the known center of rotation used to obtain the patterns. Using only slightly more complex equipment, a variation in the system will permit the phase center to be determined directly at any angle of observation around the antenna. This modified system may be servo-controlled to provide an automatic plot of relative position of the apparent phase center. The system can materially reduce the time required to determine the phase center of antennas and should be a useful tool in the study of those antennas for which a phase center does not exist. Measurements of the position of the apparent phase center of a log-periodic dipole array, a conical log-spiral antenna, and of one planar logarithmic spiral antenna as a function of the angle of observation around the antenna are included. (a-1, b-3, c-1, d-1, e-769, f-Measurement technique)

4901. WAIT, J. R., "Oblique Propagation of Groundwaves Across a Coastline - Parts I and II," J. Res. Nat. Bur. Stand., vol. 67D, no. 6, pp. 617 and 625; November-December 1963. ABSTRACT: The amplitude and phase of the groundwave are calculated for oblique propagation across a flat lying coastline. The land and sea are assumed to be smooth and homogeneous. Attention is focused on the effects which take place near the coastline. It is shown that the reflected wave depends critically on the angle of incidence, θ_0. The amplitude and phase are calculated for oblique propagation across a coastline with a sloping beach. In this case, the land and sea are taken to be plane surfaces and the beach slope is constant. It is shown that the reflected wave may be quite significant and it has a fundamentally different character from the reflected wave in the case of a flat-lying coastline. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

4902. GROBNER, O., "Propagation of VLF Waves in Highly Conducting Medium," Innsbruck University, Innsbruck, Austria, Contract No. AF 61(052)490, ASTIA No. AD-434 776; 1 December 1963. ABSTRACT: For studying the propagation of VLF waves in rock, an excursion to German and Dutch mines was made in September 1963. It was the purpose of this excursion to conduct measurements of subsurface propagation through geological bodies which in their structure and in the type of disturbances (mineralization) differed considerably from the regions of Tyrolian mines studies so far. (a-1, b-3, c-8, d-16, e-0, f-Propagation study)

4903. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products, Mountain View, California, Interim Development Report No. 4, Contract NObsr 89237, ASTIA No. AD-345 937; 10 December 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4885)

4904. JOHNSON, E. C., "Project TACAMO Investigation of Very-Low-Frequency (VLF) Propagation in the Pacific Area," Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa., ASTIA No. AD-346 187; 16 December 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4905. SHINEV, K. D., "Antennas," Air Force Systems Command, Foreign Technology Division, Edited Translation No. FTD-TT-62-1826/1+2+3+4, Defense Documentation Center Report No. AD429454; 19 December 1963. ABSTRACT: This 481 page report is a translation from Durzhavno Izdatelstvo Teknika, SOFIYA-1960, pp. 1-410. The contents contains material principally intended for fifth year students in mechanical and electrical engineering institutes having a special radio engineering department. The material content is relatively basic in nature, covering a very wide scope. General information and basic principles are presented in most instances. Pages 269-272 of the translation is concerned with the basic description and theory of the Beverage Antenna. (a-4, b-3, c-1, d-2, e-0, f-Basic reference)

4906. TRAVERS, D. N., AND MARTIN, P. E., "A Study Technique to Produce a High Frequency Land Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, San Antonio, Texas, Interim Report No. 2, Project No. SF0010805, Contract No. NObsr-89345, ASTIA No. AD-426 354; 23 December 1963. ABSTRACT: A bearing accuracy test on the 112 meter circular array of Beverage antennas with 2-degree element spacing has been initiated. About 300 of proposed 1000 useful bearings have been obtained to date. A standard deviation significantly less than that reported in 1961 for the same site with 10-degree element spacing is already apparent. The theoretical study of the Beverage antenna(s) supported in part by an experimental program is continuing. A comprehensive pattern study for various electrical and mechanical parameters has shown that simple summation of signals from adjacent antennas will cause a significant reduction in the beamwidth and the polarization error, while providing an increase in the system sensitivity. Measurements of the wave tilt angle for ground wave propagation have been completed. In general, the results support the choice of constants used in the theoretical study. (a-1, b-3, c-1, d-1, e-1000, f-Test and progress report)

4907. VASSY, E. J., "Extra Long Waves Propagation with Rockets," Paris University, Paris, France, Contract No. AF 61(052)155, ASTIA No. AD-434 771; 30 December 1963. ABSTRACT: Measurements were made of the field of a 16.8 Kc transmitter at long distance (2200 Km) versus the height. The field disappears at the height of 110 km by day as well as by night. There is no modulation when the loop rotates with the rocket. The wave presents a dispersive effect depending on the Earth's magnetic field. (a-1, b-3, c-8, d-3, e-0, f-Experiment and measurements)

4908. AMENT, W. S., "Procedures for Estimating Radio Fields Propagated by Multiple Scattering the Troposphere," Electromagnetic Research Corporation, College Park, Maryland, Report No. CRL-2724, Project 5631, Contract No. AF 19(628)272, ASTIA No. AD-601 108; 31 December 1963. ABSTRACT: Tropospheric scatter propagation is considered as a multiple scatter process, the scattering being caused by irregularities of the dielectric structure. For simplicity, the atmosphere's statistical properties and its mean refractive index are assumed to depend on altitude only. Radio propagation in such an atmosphere is then considered from the point of view of ray theory. A Monte Carlo calculation, suitable for a fast digital computer, is outlined for computing the multiply scattered fields in a two-dimensional version of the problem. An adaptation is outlined for taking

account of diffraction and weak ducting at the earth's curved surface. Further adaptations for estimating antenna performance, bandwidth, and azimuthal scattering are proposed. These considerations, and experimental evidence, lead to a statistical normal mode picture of the scatter field at far transhorizon ranges: the height-gain function and the statistics of the vertical slope components vary with range only through an exponential range-attenuation factor. Analytically prescribed atmospheric models, resembling atmospheres encountered in trade-wind inversion areas, are advanced and features of the corresponding statistical normal mode are computed analytically. For practical field computations, mechanization of the Monte Carlo calculation is recommended. Several germane, unsolved problems in the theory are noted. (a-1, b-3, c-1, d-1, e-0, f-Propagation analysis)

4909. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratory, Report No. 17, Contract No. DA 36-039-AMC-03720(E), ASTIA No. AD-437 282; 31 December 1963. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4846)

4910. MARTIN, P. E., TRAVERS, D. N., CASTLES, M. P. AND LORENZ, R., "An Experimental Beverage Antenna Array for Tactical Land Based Direction Finding between 1.5 and 30 Mc," Contract No. DA 36-039-AMC-02346(E), Progress Report No. 2; 31 December 1963. ABSTRACT: Initial results of theoretical pattern studies are presented which show trends leading to optimum designs for the special requirements of the U.S. Army. Sufficient evidence has been obtained to suggest that extensive investigation of circular arrays of Beverage antennas with larger inner radii be conducted for the 2 to 10 mc/s range in the hope of obtaining much better evaluation patterns than have been thought possible to date. Additional results of the impedance measurements including mutual coupling are presented. Some data obtained are withheld until the effects of a nonoptimum measuring technique can be evaluated by additional measurements. A push-pull amplifier circuit has been designed and evaluated for use as the RF switch in a solid state commutator. Design of the commutator logic circuits is essentially complete and construction is expected to begin in the near future. Performance of this switch element circuit is significantly better than any previous commutator switches developed at this laboratory. An examination of the DFG-2 deflection circuits has indicated that a modification will be required to properly display the nonsymmetrical patterns obtained from a circular array of Beverage antennas. Even with this modification, however, recent results for the Navy Department research work on a smaller array indicate that the accuracy of the system will be limited by the DFG-2 instrumentation. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4911. MOORE, J. D., SHERRILL, W. M., AND TRAVERS, D. N., "Portable Spaced-Loop Antenna," Southwest Research Institute, San Antonio, Texas, Quarterly Progress Report No. 1, Contract No. DA 36-039-AMC-03405(E), ASTIA No. AD-434 326; 31 December 1963. ABSTRACT: The primary effort during the first quarter of the contract has been devoted to the literature search, theoretical study, preparation of a field site and the beginning of the experimental investigation. The literature search is complete and a list of papers reviewed is given. The theoretical study has been aimed primarily at determining the best spaced-loop configuration and whether a simple sense system can be devised to resolve all ambiguities. The coaxial, vertical coplanar, horizontal coplanar spaced loops and combinations of these antennas were considered. The coaxial spaced loop is now believed best for this application, however, none of the sense schemes will always resolve all of the ambiguities. For the coaxial spaced loop, a single bearing (unambiguous) can be obtained for all but pure horizontal polarization in which case a two-way ambiguity exists. This disadvantage is not considered great as pure horizontal polarization will almost never exist for a sustained period for non-line-of-sight paths. The field site and temporary receiving equipment are described. The proposed sense method and tuning technique are discussed. Field data to date indicate acceptable coaxial spaced loop performance at all frequencies tested with sensitivity data indicating that the specification can be met (2 microvolts per meter). (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

1964

4912. ALLEN, J. L., "Array Antennas: New Applications for an Old Technique," Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Massachusetts, Contract No. AF 30(602)2415, ASTIA No. AD-612 528; 1964. ABSTRACT: Antenna arrays exist in a wide variety of configurations, with the number of radiating elements ranging from two to several thousand. However, all are governed by the same fundamental principles, which are described in this article. (a-1, b-3, c-1, d-1, e-0, f-Description)

4913. BOYS, J. A., "Review of the Jansky and Bailey Research Relating to Propagation of Radio Waves in Jungle Environments," Defense Research Corporation, Santa Barbara, California, Memorandum IMR-169; 1964. ABSTRACT: The problem of counterinsurgency communications is first reviewed with a view to placing the Jansky and Bailey (J & B) research program in context. The program is described and reviewed as to its appropriateness, adequacy, and method. It is further examined in an attempt to delineate items deserving changes in emphasis, addition, or deletion. It is concluded that the program is a necessary part of the research required for rational specification of communication systems for counterinsurgency. Comments, as to adequacy and method, are difficult to state firmly without further study and more detailed knowledge of the program. However, the opinion is expressed that more emphasis should be given to the statistical design of the experiments and to the formulation and verification of a general prediction model for path loss over arbitrary terrain and foliage. (a-1, b-3, c-1, d-1, e-0, f-Evaluation survey. See Abstract dated January, 1966)

4914. BURTNYK, N., "A Symmetrical Eight-Element Four-Phase Adcock Antenna," National Research Council, Canada, Report NRC C-7926, ASTIA No. AD-455 524; 1964. ABSTRACT: The feasibility of using commercially available wide band transformers for phase transformers for phase transformation in a symmetrical eight-element four-phase Adcock antenna was demonstrated. Errors caused by dissimilarities in transformer characteristics were negligible compared to normal site and reading errors. The theoretical sensitivity of the eight-element system compared to the conventional four-element Adcock were shown to be in a power ratio over the lower portions of the band. (a-1, b-3, c-1, d-7, e-0, f-Description)

4915. DUENO, B., "Ionospheric Propagation Studies," Puerto Rico University, Mayaguez, Puerto Rico, Contract No. AF 19(604)8342, ASTIA No. AD-603 776; 1964. ABSTRACT: A relation for the condition of minimum time delay focussing for the spherical earth geometry is obtained assuming on ionosphere with a parabolic distribution of electron density. Theoretical curves for the case of sweepfrequency backscatter are obtained that agree well with experimental values. A qualitative explanation of frequency independent echoes is given in terms of the flat earth and ionosphere approximation. Unusual cases of motions of this frequency independent echoes are discussed and explained. The diurnal and seasonal variations of backscatter echoes from the south for the years 1962 and 1963 is given and discussed. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

4916. DURRANI, S. H., "Air to Undersea Communication with Magnetic Dipoles," IEEE International Convention Record, vol. 12, Part 6, pp. 320-330; 1964. ABSTRACT: Simplified expressions are derived for the electromagnetic fields produced by a vertical or horizontal magnetic dipole (loop) located in air above the sea. The expressions hold over the quasi-near range in both media subject to certain mild restrictions. The solutions are obtained by first applying the boundary conditions to determine the magnetic Hertz potential in the form of Sommerfeld integrals and then relating these to two auxiliary integrals and their derivatives, asymptotic series for which are obtained by extending the work of Baños and Wesley. The horizontal magnetic dipoles (loop in the vertical plane) is found to be superior to the vertically oriented dipole of the same size and excitation, from the point of view of field strength induced in the sea at large distances from the source. A comparison with previously published results for the electric dipole shows the magnetic dipole to be better, provided the number of turns in the loop exceeds a certain minimum. An approximate analysis on the basis of equal powers also shows the magnetic dipole to be better except for points near the outer rim of the quasi-near range, where the two aerials are equally effective. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4917. CROMBIE, D. D., "Periodic Fading of VLF Signals Received Over Long Paths during Sunrise and Sunset," J. Res. Nat. Bur. Stand., vol. 68D, no. 1, p. 27; January 1964. ABSTRACT: Data on the periodic changes in amplitude and phase of VLF signals received over long VLF paths is examined. It is concluded that the variations are due to multimode propagation in the nighttime portion of the path. It is the purpose of this paper to give an account of the fading phenomena observed on two long VLF paths. Following this, an explanation which appears to account for most of the observation will be outlined. This explanation involves interference between the two lowest order modes propagating in the nighttime portion of the earth-ionosphere waveguide. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

4918. JACAVANCO, D. J., AND MELTZ, G., "An Experimental Determination of Antenna Pattern Distortion Due to a Plasma Layer," Air Force Cambridge Research Laboratories, Bedford, Massachusetts, Report No. AFCRL 64-18, ASTIA No. AD-436 821; January 1964. ABSTRACT: Measured radiation patterns of a plasma-covered antenna are compared with an approximate leaky wave analysis due to Oliner and Tamir. The results clearly show a shift in the optics "critical angle" and the appearance of several side lobes are predicted by theory. The plasma is produced in a He-Xe admixture at 0.4 torr by a capacitively-coupled 10-Mcps cw source and contained in a rectangular pyrex vessel of interior dimensions 8 in. by 4 in. by 5 in. Electron densities in excess of 5 X 10 to the 11th power per cc are measured by a standard microwave interferometer by manually balancing a bridge or automatically by displaying a set of interference "fringes" after a pattern is recorded. (a-1, b-3, c-1, d-1, e-0, f-Experimental results)

4919. JAEGER, G., "Compensation of Error in Radio Navigation Due to Linear Back-Scatterers in the Critical Wavelength Band," Telefunken Ztg., vol. 37, no. 1. pp. 33-48; January 1964. ABSTRACT: Errors due to secondary fields excited by passive linear structures aboard vessels are calculated. Currents are then determined, which must be impressed upon the active aerials in order to compensate for these errors at a frequency of 2182 Mc/s. Experiments with land-based structures and aboard vessels are described, and their results show that these errors can be eliminated in practice without the need for costly modifications of the aerials and other structures. (a-3, b-2, c-4, d-4, e-0, f-Analysis)

4920. LYNCH, W. M., AND PRIEDIGKEIT, J. H., "Airborne Position-Location Techniques Study," Stanford Research Institute, Menlo Park, California, Project No. 2Z44-07-001, Contract No. DA 36-039-AMC-3393(E), ASTIA No. AD-351 708; January 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4832)

4921. RATTEI, H., AND SAUR, H., "A New Direction-Finding Aerial for the Long, Critical, and Short Wave Bands," Telefunken Ztg., vol. 37, no. 1, pp. 56-61; January 1964. ABSTRACT: This crossed-loop aerial is part of a direction-finding system employing the ground-wave mode of operation in the range of 0.25 Mc/s to 30 Mc/s, and used primarily on board ships. The aerial is designed to operate in severe environmental conditions (temperature, vibration, wind). Most directional errors were caused at the low frequency end of the band by $\lambda/4$ resonances of masts. At 22 Mc/s errors were found to be smaller than 10°. (a-3, b-2, c-4, d-4, e-0, f-Description)

4922. TESTER, J. R., WARNER, D. W., AND COCHRAN, W. W., "A Radio-Tracking System for Studying Movements of Deer," J. Wildl. Mgmt., vol. 28, no. 1, p. 42; January 1964. ABSTRACT: A six-transistor, superheterodyne, portable, directional receiver, utilizing a regenerative intermediate frequency detector at 5.0 megacycles, was designed and constructed to remotely monitor movements of deer (Odocolieus virginianus) marked with radio transmitters. Construction details and a circuit diagram of a new pulsing signal transmitter are given. Transmitters were slipped over the heads of two penned does and one fawn, and the movements of these deer, after release in the wild, were recorded for a 10-day test period in December, 1962, and again on February 5, 1963. During the test period, one doe moved about within an area slightly smaller than 1 square mile whereas the other two deer remained in the vicinity of the pen. (a-1, b-3, c-1, d-1, e-0, f-Biotelemetry)

4923. WESTON, V. H., CLARK, J. E., AND PENAR, F. M., "New VOR Counterpoise System for Reduction of Siting Error," Conductron Corporation, Ann Arbor, Michigan, Final Report, Project No. 115 42D, Contract No. FA WA4665, ASTIA No. AD-600 362; January 1964. ABSTRACT: The analysis of the field pattern generated by an Alford loop above a circular counterpoise is treated quite effectively by replacing the fields of the Alford loop by those of a nearly equivalent circular loop, this being justifiable upon consideration of the frequency and dimension parameters involved. A detailed theoretical analysis results in an expression for the free space field pattern of a circular loop above a large counterpoise as a function of the following parameters: wavelength of transmitted energy, height of loop above counterpoise, and size of counterpoise. The expression holds for counterpoise, diameters large compared to wavelength. Experimental verification of field patterns was possible for all single and double loop configurations under consideration, including both small and large diameter counterpoise. The antenna elements employed were actual scaled versions of the operational Alford loops. Precautions in measurement technique, such as placement of microwave absorbant material were vital to obtaining good nulls in the multiple loop patterns. The multiple loop patterns present significant improvement in essential radiation characteristics over the single loop configuration and it is therefore felt that serious consideration should be given to use of the multiple loop configuration as a means of eliminating VOR bearing errors in areas containing undesirable geographic and man-made characteristics. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4924. DUNLAVY, J. H., JR., "New High-Frequency Antenna - Passive Network Array," Electronics, vol. 37, no. 1, pp. 34-36; 3 January 1964. ABSTRACT: Passive network array is physically small antenna which gives free-space directivity gain of 9-11 db above isotropic radiator over frequency range of 2-30 Mc; antenna consists of 2 closely spaced end-loaded dipoles fed by 2 matched broadband baluns and hybrids. (a-1, b-2, c-1, d-1, e-0, f-Description)

4925. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products Ind., Mountain View, California, Report No. 63R87, Project No. SS024-001, Contract No. NObsr-89237, ASTIA No. AD-346 782; 15 January 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4903)

4926. ROSS, S. W., AND LARSON, D. C., "Electronic Warfare Analysis of 1968-70 U.S. Army Combat Surveillance Complex. Volume 1. Description and Employment of Ground-Based Systems," Electronic Defense Laboratories, Mountain View, California, Report No. EDL-E68-Vol. 1-Pt. A, Contract No. DA 36-039-AMC-00088(E), ASTIA No. AD-358 678; 17 January 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-0)

4927. ROSS, S. W., AND LARSON, D. C., "Electronic Warfare Analysis of 1968-70 U.S. Army Combat Surveillance Complex. Volume 1. Description and Employment of Ground-Based Systems," Electronic Defense Laboratories, Mountain View, California, Report No. EDL-E68-Vol. 1-Pt. B, Contract No. DA 36-039-AMC-00088(E), ASTIA No. AD-358 679; 17 January 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See preceding abstract)

4928. ANONYMOUS, "Theoretical Study, Shipboard Direction Finding Antenna Array," Space-General Corporation, El Monte, California, Contract N123-(955)33769A, Final Report, ASTIA No. AD-603 654; 24 January 1964. ABSTRACT: The major conclusion that can be drawn from this study is that self-focusing, wide aperture, linear antenna arrays are feasible as shipboard direction finders. It has been found that wide aperture direction finding systems have decided advantages over narrow aperture systems, and a self-focusing or adaptive wide aperture system has an additional advantage in that it has a memory capability. It has been shown that multiple sources can be resolved by a self-focusing, wide aperture antenna system in contradistinction to ordinary narrow aperture direction finders which give erroneous bearings when multiple sources are present. It has been found, empirically, that a linear array can resolve a number of sources greater than one-fourth, but less than or approximately equal to one-third the number of elemental antennas in the array. This, of course, presupposes that the sources are separated by more than an array beamwidth so that they are resolvable. In addition, a self-focusing wide aperture, direction finder is less susceptible to the effects or reradiating objects in the ships environment. The effect of these reradiators is to increase the sidelobe levels somewhat and to increase the beamwidth very slightly. However, completely erroneous bearings are not obtained as in the case of a narrow aperture direction finder. In addition, various techniques have been described to show how the data stored in the self-focusing or adaptive antenna array can be utilized to give an indication of the bearings to the source or sources detected. It has also been shown how the self-focusing system can be scanned in frequency by electronic means. (a-1, b-3, c-1, d-1, e-0, f-Study and investigation)

4929. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," Electrical Engineering Research Laboratory, University of Illinois, Urbana, Illinois, Report No. 18, Contract Nos. DA 36-039-AMC-0372(E) and DA 36-039-sc-87264, ASTIA No. AD-436 820; 31 January 1964. ABSTRACT: The stated purpose of this contract is to continue and extend the theoretical and experimental research studies and investigations which will lead to the definition of the basic elements of design of an improved radio direction finding and radiolocation system for use in the MF, HF, and VHF ranges. The plan for the continuation and extension of the work proposed under subject contract has been organized under two principal tasks. These are: Task I - Radio direction finder and radiolocation systems engineering: Task II - Radio propagation and radiolocation research. (a-1, b-3, c-1, d-1, e-755, f-See Abstract No. 4909)

4930. ANONYMOUS, "Report on Research at AFCRL," Air Force Cambridge Research Laboratories, Bedford, Massachusetts, ASTIA No. AD-602 165; February 1964. ABSTRACT: This report summarizes the research activities of the Air Force Cambridge Research Laboratories and describes recent achievements, progress and results obtained by AFCRL scientists. It was our goal in this report to document the research conducted by AFCRL and its contractors in a form that would be understandable and meaningful to the well-informed lay reader as well as to the technical reader. We sometimes fell short of our goal but we always tried to keep it in sight. The report is not intended to be a complete record of the AFCRL program. This program is simply to large to cover, without abridgement, in a volume of this size. Moreover, we have omitted from the report the classified parts (about 15 percent of the total) of our program. In reviewing this report, I find that our highly important theoretical studies have not been dealt with in proper proportion. One reason for this is that a description of such studies, of necessity, often demands mathematical expressions which we have attempted to avoid. With these qualifications, however, the report accurately reflects the AFCRL program structure and the increased growth and vitality of the AFCRL program during the past year. (a-1, b-3, c-1, d-1, e-982, f-Report summary)

4931. ANONYMOUS, "Two Dimensional DF Techniques," American Electronic Laboratories, Inc., Colmar, Pennsylvania, Project No. 4505, Contract No. AF 30(602)2952, ASTIA No. AD-349 074; February 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4932. HUGHES, L. R., GIBBS, J. H., AND MORGAN, L. A., "Target Accuracy Experiment," Smyth Research Associates, San Diego, California, Contract No. AF 30(602)2084, ASTIA No. AD-432 414; February 1964. ABSTRACT: The earth's atmosphere distorts the radio view of space vehicles as seen from the earth's surface. The limitations placed on ones ability to position and locate objects in space as a consequence of this distortion is the subject of the reported investigations. A detailed experimental program was pursued to measure particularly the elevation angle errors incurred in making space target measurements from the earth's surface when viewing near the horizon. Signals originating in artificial earth satellites were viewed through the distorting atmospheric medium and analyses performed to define the observed distortions as a function of space, frequency, and time. (a-1, b-3, c-1, d-1, e-0, f-Experimental results)

4933. HOUSTON, R. E., "Ionospheric Studies Utilizing Artificial Earth Satellite Radio Signals," New Hampshire University, Durham, New Hampshire, Contract No. AF 19(604)4145, ASTIA No. AD-615 585; February 1964. ABSTRACT: A completely phase-locked, automatically tracking, narrow-band receiving system designed specifically for use with low-power radio signals emitted by artificial earth satellites is described. Methods utilizing the Doppler frequency shift and Faraday rotation for the study of the regular ionosphere are outlined. Also, scintillation methods and a spaced antenna configuration for the study of irregularities in the ionosphere are discussed. (a-1, b-3, c-1, d-1, e-0, f-Description)

4934. MILLS, D. L., "The Michigan Automatic Direction Finder," Cooley Electronics Laboratory, University of Michigan, Ann Arbor, Michigan, Project No. 3A99-06-001-01, Contract No. DA 36-039-sc-89227, ASTIA No. AD-435 849; Feburary 1964. ABSTRACT: This report describes the theoretical basis and practical instrumentation of the Michigan Automatic Direction Finder (MADFI). The MADFI is an integrated data collection, processing, and display system for determination of bearing statistics of signals in the high-frequency radio spectrum and is intended as a research tool in the study of propagation phenomena and direction finding techniques. Signal processing includes narrowband postdetection filtering and a type of linearly-weighted time averaging which improves the bearing estimates in the presence of multipath and noise processes. The MADFI is equipped with several types of readout suitable for telemetry transmission and computer processing of bearing statistics. (a-1, b-3, c-1, d-1, e-0, f-Description)

4935. SHERRILL, W. M., TRAVERS, D. N., AND MOORE, J. D., "Evaluation of the AN/BRD-4 Direction Finder," Southwest Research Institute, San Antonio, Texas, Task Summary Report No. XVII, Project No. SF0010801, Contract No. NObsr-89167, ASTIA No. AD-346 800; 10 February 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-1000, f-0)

4936. SEIDEL, K. G., "Evaluation of UHF Personal Locator Beacon," Test Squadron (4750th), Tyndall AFB, Florida, Final Report, ASTIA No. AD-441 309; 10 February 1964. ABSTRACT: The interim UHF personal locator beacon was designed as an aid to aircrew survival. Evaluation of this equipment was conducted by ADC to determine adequacy of installation procedures, operational capabilities and low temperature characteristics. Results of the evaluation indicated the following: (1) proposed installation instructions were unsatisfactory, (2) average beacon homing ranges using standard UHF/ADF equipment varied from 7 nm at 500 feet terrain clearance to 55 nm at 20,000 feet terrain clearance. (3) actual beacon location can be determined within 1/8 of a mile, (4) beacon battery life is limited at temperatures below 32°F, (5) several design deficiencies were noted. Recommendations are that: Revised installation instructions contained in Appendix C be evaluated by ASD, a suitable cold weather electrical power supply be developed, search and rescue homing equipment be refined to provide extended homing ranges and the beacon deficiencies outlined in this report be corrected. (a-1, b-3, c-1, d-1, e-0, f-Evaluation)

4937. ANONYMOUS, "H-F Array Scans Horizon," Electronics, vol. 37, p. 50; 14 February 1964. ABSTRACT: University of Illinois' radiolocation lab is working on a new style of directional antenna array - one that would use frequency-independent, log-periodic elements. It could be used for directional long-distance transmission and reception. Electronic scanning of 160 elements in a 1,000 to 2,000-foot-diameter array could spin a fan-shaped beam, 1 to 30 degrees wide, around the horizon several times a minute, Prof. Paul Mayes reported at the University's antenna forum two weeks ago. The lab now operates a Wullenweber antenna. The new system, called WARLA (Wide Aperture Radio Location Array) being developed by the University and Navy, would update that installation. Where folded monopoles of the Wullenweber limit its operations to receiving, WARLA's log-periodic elements could be used for transmitting in a global, point-to-point, military communications network, according to John Greiser, of the lab. Frequency range of the Wullenwebe is 4 to 16 Mc. WARLA's is 2 to 32 Mc. Beam width would change from 30 degrees to 1 deg, the beam's pointing accuracy from 1 deg to 1/4 deg, and gain from 35 db to 20 db as transmitting frequency rises. (a-1, b-2, c-1, d-1, e-649, f-Short article with diagrams)

4938. HINSHAW, M. P., LA BAHN, R. W., AND MARTIN, J. N., "Very-Low-Frequency Antenna Research Program. Part III. Six-Loop Array," Naval Ordnance Laboratory, Corona, California, Report No. 598, pt. 3, ASTIA No. AD-449 563; 15 February 1964. ABSTRACT: Experimental work was conducted to test the theory that superdirective VLF antennas, required for certain systems, are practical, not only for reception of monochromatic signals, but also for the reception of wide-band signals such as sferics (atmospheric interference). An array consisting of two three-loop elements, summed to form a broadside array, was designed. The bandwidth is 10 to 30 kc and the theoretical half-power beamwidth is 28 deg at 30 kc. Side-lobe and back-lobe levels are minimized for discrimination against atmospheric noise over the band. Testing and evaluation results lead to the conclusion that the six-loop, superdirective array is practical for the intended application; however, further study is recommended. In order to determine the theoretical capabilities of the six-loop superdirective array for sferic reception, the array was simulated on a digital computer and sferic waveforms were digitized for the input. (a-1, b-3, c-1, d-1, e-0, f-See following abstract)

4939. SCHRINER, D. A., AND HINSHAW, M. P., "Very-Low-Frequency Antenna Research Program. Part I. Antenna Measurement," Naval Ordnance Laboratory, Corona, California, Report No. 598, ASTIA No. AD-449 564; 15 February 1964. ABSTRACT: This report describes the passive pattern plotter (PPP), an antenna measuring device developed to measure the reception patterns of the large antennas constructed as a part of the VLF antenna research program. The PPP measures the bearings of sferics (the electromagnetic radiation emitted by lightning discharges) as received by a crossed pair of loop antennas and compares the signal received by a short monopole. The results are presented on oscilloscope screens, which are automatically photographed by a shutterless pulse camera. The photographic data are then reduced and plotted to form the antenna pattern. The functions of all PPP circuit components are described in detail. An actual pattern-measurement test is described and several patterns made with the PPP are shown. The measurement of VLF antennas by using the directional-antenna noise-discrimination technique is described. Part II discusses the concept of superdirectivity, its advantages and disadvantages, previous work, and the reduction in antenna size possible. Equations for half-power beamwidth, effective height, and ratios of front lobe to back lobe and front lobe to side lobe are presented. The array of "n" loops is discussed, and a six-loop array is analyzed. (a-1, b-3, c-1, d-1, e-0, f-See preceding and following abstracts)

4940. SEELEY, E. W., "Very-Low-Frequency Antenna Research Program. Part II. Superdirective Antennas," Naval Ordnance Laboratory, Corona, California, Report No. 598, pt. 2, ASTIA No. AD-449 577; 15 February 1964. ABSTRACT: The concept of superdirectivity is discussed, and previous work is reviewed. Reductions obtainable in the physical size of VLF antennas are demonstrated, and advantages and disadvantages of the concept are outlined. Equations for half-power beamwidth, effective height, and ratios of front lobe to back lobe and front lobe to side lobe are presented. The array of n loops is discussed, and equations that describe its properties are included. Beverage elements are discuused, and the voltage-pattern equations are given. Superdirective arrays composed of coaxial loops are introduced, and equations are derived for the pattern of coaxial-loop pairs; patterns equations and plots indicate high directivity for small loop spacings. The use of nonlinear signal processing for elements of a superdirective antenna is discussed and found to have considerable merit. (a-1, b-3, c-1, d-1, e-707, f-Study report)

4941. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products Incorporated, Mountain View, California, Report No. 64R3, Project No. SS024-001, Contract No. NObsr-89237, ASTIA No. AD-347 857; 17 February 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4903)

4942. ANONYMOUS, "Technical Evaluation of the AN/ARA-25 UHF Direction Finding Equipment," Naval Air Test Center, Patuxent River, Maryland, ASTIA No. AD-431 795; 27 February 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation report)

4943. SHERRILL, W. M., AND TRAVERS, D. N., "Comparison of Technical Specifications for Three Twin/Triple Channel HF Receivers," Southwest Researcn Institute, San Antonio, Texas, Task Summary Report Number XVIII, Contract NObsr-89167; 29 February 1964. ABSTRACT: A survey of all phase and gain matched multichannel receivers which are offered for sale by various industrial concerns, for the 2- to 3-mc range, shows that the following twin/triple channel receivers may be ordered: (1) RA. 153 Twin Channel Receiver, Racal Electronics, Ltd., Bracknell, Berkshire, England; (2) NOTCH Twin/Triple Channel Receiver, General Precision Industries, Ltd., Montreal, Quebec, Canada; (3) IR-3 Twin/Triple Channel Receiver, Intercept Research, Inc., Champaign, Illinois, U.S.A. A comparative summary of the technical specifications of these receivers with price and delivery information is presented. Receiver specifications include phase and gain match tolerances, stability of matching, channel calibration, sensitivity, bandwidths, conversions, and other receiver characteristics. The capability of these receivers for modern shipboard direction finding applications is reviewed in detail. Particular areas of interest include receiver AGC, future adaptability to frequency synthesizer tuning counter readout of tuned frequency, and bearing display. (a-1, b-3, c-1, d-1, e-1000, f-Evaluation)

4944. ADAMS, R. T., "Beam Tagging for Control of Adaptive Transmitting Arrays," Trans. IEEE, vol. AP-12, no. 2, p. 224; March 1964. ABSTRACT: Conventionally, self-focusing or steering of an adaptive array has always been controlled by signal measurements made in the receiving mode. By the use of beam tagging, a transmitting array can be made adaptive. The signal from each array element is tagged with identifying modulation, and a single sample from the far field can then be analyzed to find control information for the set of transmitting-element phases and amplitudes. The technique can be used with two-way (transmit-receive) arrays or with arrays used solely for transmitting. It can also be used in combination with conventional techniques for controlling adaptive arrays. (a-1, b-1, c-1, d-1, e-0, f-Technique)

4945. ANDRE, S. N., AND LEONARD, D. J., "An Active Retrodirective Array for Satellite Communications," Trans. IEEE, vol. AP-12, no. 2, p. 181; March 1964. ABSTRACT: The concept and design of an active retrodirective array, resulting from the specialized requirements and constraints of space/earth communications, is presented. The advantages of employing active microwave gain are discussed. The attendant problem of instability is defined and several aspects of the solution, namely frequency offsetting and polarization isolation, are detailed. The latter technique makes use of orthogonally polarized "subarrays" - one for receiving and one for transmitting - intermeshed on a common aperture surface. A discussion of tolerable phase errors and the effect of element failure on the system reliability is presented. Techniques for realizing the active circuitry required for the functions of RF amplification, frequency conversion and modulation are described. An experimental model, employing strip transmission line techniques throughout, was fabricated and tested. All results, including those of array gain, retrodirectivity and simultaneous retrodirectivity from several sources at different frequencies, and effects of element removal, corresponded closely to their calculated predictions. (a-1, b-1, c-1, d-1, e-0, f-Descriptive analysis and discussion)

4946. DELFI, C. A., ROTHENBERG, C., SCHWARTZMAN, L., TILLEY, R. E., AND WILLS, A., "A Satellite Data Transmission Antenna," Trans. IEEE, vol. AP-12, no. 2, p. 200; March 1964. ABSTRACT: A retrodirective satellite antenna for a broad bandwidth, satellite-to-ground data transmission link, is described. An information-collecting satellite which transmits its data in the direction of the ground receiver upon command, is considered. The satellite antenna described for this system is an active retrodirective antenna which utilizes the beam-forming characteristics of a phasing matrix. A signal from the ground station is received on a particular beam port of the matrix which corresponds to a particular beam-pointing direction. Control circuitry in the satellite activates a switching matrix and a transmitter so that the data-carrying signal is transmitted in the same direction from which the satellite is interrogated. Other retrodirective techniques in addition to the phasing-matrix antenna are evaluated in terms of their relative merit. The systems considered include the active Van Atta array, the automatic three-dimensional electronic scanning antenna (ATHESA), the Luneberg lens and various other antenna array techniques. (a-1, b-1, c-1, d-1, e-0, f-Description)

4947. COPELAND, J. R., ROBERTSON, W. J., AND VERSTRAETE, R. G., "Antennafier Arrays," Trans. IEEE, vol. AP-12, no. 2, p. 227; March 1964 ABSTRACT: The integrated transistorized dipole antennafier (antenna-amplifier) is ideally suited for use in array systems. The advantages include ease of amplitude-distribution control, low noise, high gain, high reliability and simplicity. The integration is achieved by using the antenna as a circuit element of the transistorized amplifier, thus eliminating the tuned input circuits and transmission lines commonly used. A four-element broadside array of antennafiers is described in which the gain of each element is varied by controlling the base bias. Binominal, uniform, edge and Dolph-Chebyshev distributions were chosen to show the wide variation of beam control possible; the resulting measured and calculated patterns, half-power beamwidths, gain over a half-wavelength dipole, and noise temperatures are presented. A method of experimentally evaluating the noise performance, based on a theoretical development, is also described. (a-1, b-1, c-1, d-1, e-0, f-Analytical evaluation)

4948. GHOSE, R. N., "Electronically Adaptive Antenna Systems," Trans. IEEE, vol. AP-12, no. 2, p. 161; March 1964. ABSTRACT: Electronically adaptive receiving and transmitting antenna systems which can be employed for ground tracking stations and satellite and space vehicles are discussed. The receiving antenna systems described herein contain active elements which, unlike in passive antenna arrays, automatically adjust the electrical phases of the signals received by the array elements to obtain antenna directivity. The self-focusing feature of these receiving antenna systems is achieved by a set of phase-locked loops, which permit phase adjustments of signals received by various antenna elements continuously regardless of the direction of the transmitting source. For a transmitting antenna, the self-focusing feature is provided by a pilot signal from the receiving station which enables the transmitting antenna beam to point in the direction of the receiving station atuomatically. The basic principles of operation of active adaptive receiving and transmitting antenna arrangements, including performance analyses in the presence of noise, are presented in this paper to demonstrate the usefulness of such antennas. (a-1, b-1, c-1, d-1, e-0, f-Description and analysis)

4949. GRUENBERG, E. L., "Satellite Communications Relay System Using a Retrodirective Space Antenna," Trans. IEEE, vol. AP-12, no. 2, p. 215; March 1964. ABSTRACT: A system has been developed for relaying messages via a satellite between earth points. In this system, messages transmitted to a satellite modulate a retrodirective antenna. Earth stations receive messages by irradiating the satellite antenna. Methods of modulating the retrodirective array are discussed with emphasis on methods of facilitate communications among several ground stations. There are advantages in spectrum usage and sharing with surface facilities. System design parameters are presented. Minimal power is required in the satellite as compared to the active communications satellites. Extremely high reliability is inherent in the design of the satellite electronic system, which can be made entirely from solid-state components. (a-1, b-1, c-1, d-1, e-0, f-Description)

4950. HANSEN, R. C., "Special Issue on Active and Adaptive Antennas," Trans. IEEE, vol. AP-12, no. 2, p. 140; March 1964. ABSTRACT: Recent years have seen advances in antenna systems wherein antenna elements operate in such an integrated fashion with

circuit elements that it is often difficult to say where the antenna portion stops. We are all familiar by now with such integrated antenna systems as multiple beam arrays, synthetic apertures, time modulated radiators, and correlation arrays, to cite several examples. The latest area of advance in these integrated systems seems to embrace two new capabilities: retrodirective systems, i.e., which radiate a wave in the direction of a received wave, and self-steering or self-focusing arrays; these both are called "adaptive arrays." These two new techniques are the subject of this special issue. In addition, the issue treats dipole type elements where the dipole structure serves also as part of the microwave circuitry for a parametric amplifier, down converter or amplifier. Thus the radiating element and a portion of the receiver front end are physically combined; such "active elements" are directly applicable to the adaptive arrays. The simplest retrodirective array is the Van Atta array consisting of elements properly connected to each other by transmission lines. It is the discrete analog of the corner reflector, and has similar interference lobes due to interaction of reradiated and scattered fields. In the patent (applied June 1955, granted October 1959) Van Atta also discusses use of active elements in each transmission line. Modulation of the array was then proposed by Bauer. In the meantime, the development of phase-lock loop theory and practice made possible the self-steering type of adaptive array. Altman and Sichak proposed use of phase-lock loops were used to phase lock each signal, i.e., antenna and receiver, to a stable oscillator. Lehan and Hughes in their patent (applied November 1959, granted May 1962) show how this same principle can be used to phase coherently add signals from different antenna elements in an array. A further advance allowed the phase-lock loop scheme to produce retrodirectivity; the conjugate phase front required for retrodirectivity is contained in the lower coherent sidebands, and these are remodulated onto the transmitter output to produce a wave radiated in the proper direction. Applications of these adaptive antenna systems seem to be plentiful, and system tradeoff studies are just starting to appear. The self-steering antenna system allows a large receiving aperture to be comprised of smaller apertures, each of which has only to be pointed with its usual accuracy. In this way, apertures greater than the current single steerable aperture limit of around 300-ft diameter can be realized. Furthermore, directivity limitations due to manufacturing tolerance or due to tropospheric scintillations can be overcome at least in principle. Self-focusing, for targets within the radiating near field region, would allow optimum radar return. Beam tagging would also allow phase front errors in the transmitted wave to be corrected. Applications in diversity combining are obvious. Retrodirective systems have attractive features for satellite telemetry or communications. For example, an active Van Atta system on a deep space probe could send back data to earth with high directivity (realized twice) but with very modest IF type amplification in the bird. Or satellite telemetry could be read out from a ground station by transmitting cw pilot (up) signal which would be modulated by the array. High directivity could be realized since the usual beamwidth limitations do not apply. The modulating signal could be received at the bird from another station, thereby providing point-to-point communications with modest vehicle power. Adaptive arrays of many elements, e.g., the retrodirective arrays, fail gracefully, the enhanced reliability more than offsets the complexity. As in any new field, there are some unsolved or insufficiently studied problems: mutual impedance effects, performance with multiple signals or targets, acquisition at low SNR, retrodirectivity or self-steering over large solid angles, effects of wide band signals - these are a few. However, the papers in this issue, and the references quoted therein, represent a major advance in a new facet of antennas. The next years will be equally exciting, and we should see hardware and system investigations culminating in a few practical satellite and ground installations. (a-1, b-1, c-1, d-1, e-0, f-Survey and discussion)

4951. HOFER, J. C., "Bibliography of University of Illinois Radiolocation Research Laboratory Publications through March, 1964," RRL Publication No. 226, Radiolocation Research Laboratory, Electrical Engineering Research Laboratory, University of Illinois, Urbana, Illinois; March 1964. ABSTRACT: A first attempt to consolidate listings of all publications to date by staff members of the Radiolocation Research Laboratory (formerly known as the Radio Direction Finding Laboratory). The listing represents all of those materials processed as input for the Radiolocation Research Laboratory computerized bibliography system through March, 1964. Attempts have been made to include all published contract reports (including technical notes written for limited distribution), reprints of articles published in professional journals and presentations at meetings of professional organizations. Listings were made by the LP-12 printer of the CDC G-20A system. Revisions of this bibliography will be made as additional materials are published and any omitted items are processed. (a-1, b-3, c-1, d-1, e-829, f-Bibliography)

4952. KOSENKOV, O. M., "The Electromagnetic Field of a Circular Loop at the Earth-Air Boundary," Bull. Acad. Sci. USSR, Geophys Ser., no. 12, pp. 1122-1126; March 1964. ABSTRACT: The electromagnetic field of an insulated circular current-carrying loop lying on the surface of the earth is computed using an expression for the vector potential of an electric dipole given by Zaborovskii (Variable Electromagnetic Fields in ElectricGeophysical Surveying Moscow State University 1960). The method gives the tangential component of the electric field and the vertical component of the magnetic field at the earth's surface. (a-3, b-1, c-1, d-2, e-0, f-Theory)

4953. PARKS, G. S., JR., PRICE, G. H., WHITSON, A. L., AND PARKER, H. W., "Measurements of VLF Wavefront Components over Long Paths," Final Report for Contract NObsr-85271, Stanford Research Institute; March 1964. ABSTRACT: A receiving system that sampled six components of the received wavefront, three orthogonal E field components and three orthogonal H field components was operated at Perth, Australia. A prototype system was also operated at Tracy, California. Transmissions at VLF from five USN stations were monitored. Data have been processed for periods between April and August, 1963. Theoretical mode theory results are presented. Wavefront data are presented and by comparison to theoretical results show limitations of theory for antipodal effects. Horizontal electric field components appear larger than theory. E to H ratios also depart some time from the 377 ohm value. Data during the solar eclipse of 20 July 1963 is included. D/F bearings from crossed loops are presented. (a-1, b-3, c-1, d-1, e-850, f-Project summary)

4954. PON, C. Y., "Retrodirective Array Using the Heterodyne Technique," Trans. IEEE, vol. AP-12, no. 2, p. 176; March 1964. ABSTRACT: A retrodirective array using a single microwave mixer to accomplish conjugate phase shift in each element is described. Reradiated patterns were measured for a four- element array to substantiate the predicted performance. This array has an advantage over the Van Atta array in that the elements are not restricted to being located on a plane surface. It is more efficient than the previously used method of employing two mixers to provide conjugate phase shift because of the reduction in conversion loss and LO (local oscillator) power (a-1, b-1, c-1, d-1, e-0, f-Description and comparison)

4955. RUTZ-PHILIPP, E. M., "Spherical Retrodirective Array," Trans. IEEE, vol. AP-12, no. 2, p. 187; March 1964. ABSTRACT: This paper derives the characteristics of a spherically-shaped retrodirective space array. The array can receive an incoming signal over 4π steradians, amplify, frequency translate, and modulate this signal, and then return it in the direction of the incident wave. The directivity of the array for every angle of incidence corresponds to the area illuminated by the incoming wave. In the array the retrodirective characteristic is obtained by a phase inversion technique that is realized in tunnel-diode image frequency converters. A circular cross section of the spherically-shaped retrodirective array is analyzed. The analysis is extended to the spherically-shaped array. It is shown that the effective aperture of a spherical array is smaller than the illuminated area. This reduction occurs because of a tapered amplitude distribution and a symmetrical phase error proportional to the frequency difference between incident wave and reradiated wave at the image frequency. The output spectrum of the converters in the array contains not only the image frequency signal but additional frequency components as well. Because of the phase characteristics of the spectral components, only the image frequency signal when reradiated by the array elements will add coherently in direction of the incident wave. The reradiation of the other frequency components is not collimated. (a-1, b-1, c-1, d-1, e-0, f-Theoretical analysis)

4956. SCHRADER, J. H., "A Phase-Lock Receiver for the Arraying of Independently Directed Antennas," Trans. IEEE, vol. AP-12, no. 2, p. 155; March 1964. ABSTRACT: This paper describes a phase-lock receiver designed to accomplish the arraying of four independently steerable antennas and provides some measured performance data. The results indicate that the performance of such an array will be comparable to that of a single antenna with the same aperture and a conventional phase-lock receiver. (a-1, b-1, c-1, d-1, e-0, f-Description)

4957. SICHELSTIEL, B. A., WATERS, W. M., AND WILD, T. A., "Self-Focusing Array Research Model," Trans. IEEE, vol. AP-12, no. 2, p. 150; March 1964. ABSTRACT: A self-focusing array antenna model is described with a brief synopsis of an experimental program which was carried out to evaluate the technique and to demonstrate the principle by means of an operating model. The results of tests performed on linear and planar versions of the array are given in the form of field patterns. They show the successful operation of self-focusing in the presence of several factors including multiple

targets, extended targets, moving targets and simulated atmospheric inhomogeneities. (a-1, b-1, c-1, d-1, e-0, f-Description)

4958. SKOLNIK, M. I., AND KING, D. D., "Self-Phasing Array Antennas," Trans. IEEE, vol. AP-12, no. 2, p. 142; March 1964. ABSTRACT: A self-phasing array antenna is described which operates onthe incident wavefront in such a manner that when it is retransmitted it returns whence it came as a coherent wavefront irrespective of the original phase distribution incident on the array. Self-phasing is useful where a two-way propagation path is available and where a conventional antenna cannot operate efficiently because of an unknown phase distribution in the incident wavefront. The operation of a self-phasing array, its properties, its relation to other antenna design techniques and its potential applications are discussed. (a-1, b-1, c-1, d-1, e-0, f-Description)

4959. SVOBODA, D. E., "A Phase-Locked Receiving Array for High-Frequency Communications Use," Trans. IEEE, vol. AP-12, no. 2, p. 207; March 1964. ABSTRACT: An automatically phased HF receiving array using separate RF amplifiers for each element and IF signal combination is discussed. The type of array considered corrects essentially all phase errors between the distant transmitter and the point where the received signals are combined. This includes errors due to the propagation path, array element motion, near-field obstructions, and instabilities in electronic equipment and RF cables. The array also corrects phase shifts due to changes in angle of arrival, thus giving it the highly desirable property of automatically tracking a desired signal. The effects of interference on array performance and methods for minimizing these effects are discussed. The effect of a single monochromatic interfering signal is discussed in some detail, and results showing regions of acceptable and unacceptable performance in terms of the ratio of desired-to-interfering signal strength and the difference between desired and interfering signal frequencies are presented. A six-element experimental array is described, a technique for measuring patterns is discussed, and measured array patterns are compared with calculated array patterns. (a-1, b-1, c-1, d-1, e-0, f-Discussion and description)

4960. VOSSLER, R. A., "A Program for Plotting the Radiolocation Predictions and Analyzing Their Errors," Engineering Experiment Station, University of Illinois, Urbana, Illinois, RRL Report No. 230, Contract Nos. DA 36-039-AMC-03720(E) and Nonr-1834-02, ASTIA No. AD-601 397; March 1964. ABSTRACT: This program analyzes the errors of radiolocation predictions and evaluates the average range errors, the root mean square range error, and ten, twenty, and thirty minute cumulative averages of the range errors for both the following:
(a) Range errors of the predicted range with respect to the true range of the transmitter where range is measured from the receiver.
(b) Range errors of the predicted transmitter position where range is measured from the known transmitter location. In addition to this, the computer punches up paper tapes for operating an X-Y plotter. Two types of graphs are obtained in this manner. One is a plot of predicted range error vs. time where range is measured from the receiver. The other is a plot of the range and bearing of the predicted transmitter position with respect to the known transmitter location. The latter graph is referred to as a target plot. This program is coded in SPAR. The computer involved in this case is a Control Data Corporation G-20A using the SPACE programming system. (a-1, b-3, c-1, d-1, e-0, f-Analyser)

4961. WAIT, J. R., "Oblique Projection of Groundwaves Across a Coastline - Part III," J. Res. Nat. Bur. Stand., vol. 68D, no. 3, p. 291; March 1964. ABSTRACT: This paper, which is a continuation of two earlier papers of the same title, contains numerical results for the field anomaly near a coastline when the surface impedance changes in a linear manner between land and sea. The earlier results for an abrupt boundary are recovered as the width of the transition region is reduced to zero. In general, it is found that the characteristics of the transition region will not produce significant modifications of the transmitted field. However, the magnitude of the reflected field is greatly reduced as the width of the transition zone is increased beyond about one-quarter wavelength. (a-1, b-1, c-1, d-1, e-0, f-See Abstract No. 4901)

4962. ANONYMOUS, "Investigation of Research on Techniques for Integration of Active Elements into Antennas and Antenna Structure," Ohio State University Research Foundation, Columbus Antenna Laboratory, Columbus, Ohio, Report No. 1566-9, Contract No. AF 33(657)-10386, ASTIA No. AD-600 105; 1 March 1964. ABSTRACT: Circuitry for an elementary direction-finding system, using integrated design concepts, is discussed. Preliminary measurements indicate that good performance of the amplitude and phase-shift beam-control array may be expected because of the good agreement between calculated and measured amplitude and phase-shift performance of the individual dipole antennafier elements. The elementary direction-finding and homing system is nearly completed. Based upon the simulated antenna patterns, it is estimated that the completed system will provide reasonably accurate directional information in a 45° cone surrounding the system's symmetry axis, and should yield useful information in an approximately 90° cone. (a-3, b-3, c-1, d-1, e-0, f-Study and investigation report)

4963. BELROSE, J. S., AND BURKE, M. J., "Study of the Lower Ionosphere Using Partial Reflection, Experimental Techniques and Method of Analysis, Defense Research Telecommunications Establishment, Ottawa, Ontario, ASTIA No. AD-454 951, 16 March 1964. ABSTRACT: The amplitude of weak echoes partially reflected from ionization irregularities in the height range 50-100 km are recorded. By utilizing two frequencies, 2.66 and 6.27 Mc/s, and recording the amplitudes of both the ordinary and extraordinary component waves information is obtained about electron density and electron collision frequency in this height range under both normal and abnormal conditions. The method of analysis (discussed in detail in this paper) is essentially similar to that developed by Gardner and Pawsey, except that the generalized magnetoionic formulas, which take into account the energy dependence of the collision cross section, are employed. The results being obtained are believed to be more accurate in detail than those obtained by the other ground-based techniques. (a-1, b-3, c-1, d-7, e-0, f-Study and analysis)

4964. ANONYMOUS, "Passive Electronic Intercept Techniques and Devices," Aerospace Information Division, Library of Congress, Washington, D.C., Report No. AID-U-64-15, ASTIA No. AD-622 235; 18 March 1964. ABSTRACT: Abstracts are compiled from Soviet open-source materials on passive electronic intercept techniques and devices. The following topics are considered: receiving equipment; receive detection techniques; direction finding techniques; antennas; atmospheric propagation; data transmission and recording. (a-3, b-3, c-8, d-2, e-0, f-Bibliography)

4965. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products, Inc., Mountain View, California, Report No. 64R5, Project No. SS024 001, Contract No. NObsr-89237, ASTIA No. AD-348 733, 20 March 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4941)

4966. TRAVERS, D. N., MARTIN, P. E., AND SHERRILL, W. M., "Use of the Beverage Antenna in Wide Aperture High Frequency Direction Finding. Part III. Bearing Accuracy," Southwest Research Institute, San Antonio, Texas, Project SF0010805, Contract No. NObsr-89345, ASTIA No. AD-349 203; 23 March 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-1000, f-0)

4967. TRAVERS, D. N., MARTIN, P. E., AND SHERRILL, W. M., "Use of the Beverage Antenna in Wide Aperture High Frequency Direction Finding - Part IV: Theory," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. NObsr-89345, ASTIA No. AD-434 352; 23 March 1964. ABSTRACT: A detailed analyses is presented for a circular array of Beverage antennas over a conducting earth. Equations are derived for azimuth and elevation patterns for any number of similar antennas in the array taken any number at a time, spaced in any manner, and summed in any arbitrary manner with or without phasing. Of particular interest for HF direction finding applications are sector arrays of 10 to 20 antennas located 2° apart and operated between 1 and 40 mc. Simple summing (nonphased) of typical sector arrays produces patterns which have greatly reduced beamwidth compared to single element patterns. At 10 mc, a 25 meter long single element, one meter high, has a 3 db beamwidth of about 78°, while a circular sector array of 21 similar elements 2° apart has a beamwidth of about 18° without phasing. Elevation patterns for short element, large sector arrays show similarly narrow azimuth patterns up to elevation angles of 70° at 10 mc for an array diameter of less than 900 feet. The analysis provides both ground wave and sky wave patterns. For sky wave patterns the polarization of the incident field may be linear or elliptical (any condition between vertical and horizontal polarization). Calculations show the sector arrays considered so far to have low polarization error. Polarization error is further reduced as beamwidth is reduced. The analysis also provides antenna impedance, antenna line constants, effective height, wave tilt angle and various other parameters. Calculated performance shows the antennas to have impedances and patterns normally associated with frequency independent antennas. The results show that D/F performance over a 100 to 1 frequency range extending as low as 1.5 mc, should be obtained in a single array including good azimuth patterns at high elevation angles. Furthermore, the simplicity of the antenna element design permits what is probably the lowest cost wide aperture

direction finder antenna array yet designed for the MF, HF, and VHF frequency ranges. Calculated (and also as reported in Part II, measured) effective heights indicate that the summed sector arrays provide an adequate sensitivity with resulting effective heights ranging from a few meters to the vicinity of 100 meters. Bearing sensitivity is probably as good as present day instrumentation can utilize either in a scanning or fixed beam mode. It is also apparent from the analysis that the performance of the antenna array is not highly dependent on a specific earth conductivity as in the case of some D/F antennas. Reception is improved by an increased wave tilt angle usually associated with poorly conducting earth. Thus the system is probably more adaptable to varying site terrain than is the usual D/F system. This is Part IV of a four-part report and is concerned primarily with theory. Part II is concerned with system design and performance for long range HF D/F while Part III is a detailed report on measured accuracy of a 900-ft diameter array of 180 antennas. Part I was submitted in 1962. All theoretical background material necessary to the analysis has been reproduced in the Appendix. (a-1, b-3, c-1, d-1, e-1000, f-See preceding abstract)

4968. CANADY, D. R., "Steerable ECM Antenna Evaluation and Application Study," Advanced Development Laboratory, Inc., Nashua, New Hampshire, Contract No. AF 33(657)11531, ASTIA No. AD-350 499; 31 March 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4969. MARTIN, P. E., TRAVERS, D. N., CASTLES, M. P., AND LORENZ, R., "An Experimental Beverage Antenna Array for Land Based Direction Finding between 1.5 and 30 Mc," Southwest Research Institute, San Antonio, Texas, Quarterly Progress Report No. 3, Contract DA 36-039-AMC-02346(E), ASTIA No. AD-443 093; 31 March 1964. ABSTRACT: Theoretical pattern studies were continued to investigate Beverage antenna performance as a function of angle of elevation, frequency, array radii and ground constants. A recent comparison of theoretical and experimental patterns has shown that the mathematical model of the Beverage antenna may be accepted with confidence. Other studies show: (1) that no significant reduction in pattern beamwidths by linear summation of antenna inputs is predicted when the radius of the points of summation is small compared to a wavelength, and (2) the effect of poor ground conductivity indicates that reasonable performance of the frequency band of 2-32 Mc/s will require that the element lengths be less than 50 meters. The experimental program has included the continued measurement of input impedance, mutual impedance, effective height and the investigation of terrain effects at sites remote from San Antonio. (a-1, b-3, c-1, d-1, e-1000, f-Study and experimental results)

4970. MOORE, J. D., LAENGER, C. J., AND TRAVERS, D. N., "Portable Spaced-Loop Antenna," Southwest Research Institute, San Antonio, Texas, Quarterly Progress Report No. 2, Contract No. DA 36-039-AMC-03405(E), ASTIA No. AD-443 482; 31 March 1964. ABSTRACT: An investigation of sense patterns by computer calculations indicates the feasibility of the system and shows that sense can be obtained for either vertical or horizontal polarization. Field tests for sensitivity produced early in the quarter a 6 db signal plus noise-to-noise ratio at 2 microvolts per meter for all frequencies between 20 and 100 mc, except at three frequencies where a reduction in performance of no more than 1.8 db occurred. Patterns for multipolarized signals in agreement with theoretical patterns have now been obtained in field tests. Previous location of the coaxial spaced-loop antenna in close proximity of the metal roof of a portable screen room produced objectionable polarization error for any polarization other than vertical. The tripod arrangement is clearly superior in the most recent data. Preamplifier and tuning xperiments in the laboratory have indicated that a vacuum tube preamplifier with two stages of varactor diode tuning will offer the necessary improvement in performance to overcome the losses resulting from tuned circuit "Q" degradation using varactor diode tuning. A transistor preamplifier is being investigated with tuning of the antenna only because of the simplification of the control circuitry. The progress on Phase II, the design, phase, is briefly reviewed. Work to date has placed primary emphasis on the theoretical and the experimental investigation, Phase I. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

4971. BLITZ, M. H., AND SABER, N. J., "Satellite Based System for Locating Drifting Sensor Platforms," IEEE Trans., vol. AS-2, no. 2, pp. 116-124; April 1964. ABSTRACT: The problems associated with determining the position of unmanned drifting buoys and constant pressure balloons from a medium altitude satellite in a near-polar orbit are discussed. A system employing range-only measurements is described, and the errors in the computed position of the sensor platform as a result of errors in range measurement, uncertainties in knowledge of the satellite ephemeris and the altitude and velocity of the balloon are analysed. The oceanographic and meteorological operational requirements of this system are briefly discussed and the design implications of these requirements described. (a-3, b-1, c-1, d-1, e-0, f-Discussion)

4972. DILLMAN, P. B., AND DAVIS, W. L., "Engineering/Service Test of Position-Fixing and Navigation System (PFNS). Volume I. Part I. General," Army Electronic Proving Ground, Fort Huachuca, Arizona, Project No. 4-3-3150-01, ASTIA No. AD-443 864; April 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report)

4973. DILLMAN, P. B., AND DAVIS, W. L., "Engineering/Service Test of Position-Fixing and Navigation System (PFNS). Volume II. Part II. Static Engineering, Human Factors, and Training Test Data, Part III. Field Engineering and System Accuracy Test Data, Part IV. Method of Analysis and Derivations," Army Electronic Proving Ground, Fort Huachuca, Arizona, Project No. 4-33-4150-01, ASTIA No. AD-443 865; April 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report. See preceding abstract)

4974. DILLMAN P. B., AND DAVIS, W. L., "Engineering/Service Test of Position-Fixing and Navigation System (PFNS). Volume III. Part V. Operational Accuracy Test Data (Participating Text Authorities)," Army Electronic Proving Ground, Fort Huachuca, Arizona, Project No. 4-3-3150-01, ASTIA No. AD-443 866; April 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test report. See preceding abstract)

4975. KAUFMAN, M. C., "Radio Interferometry-Techniques Used by the U.S. Naval Space Surveillance System," Proc. IEEE, vol. 52, no. 4, p. 421; April 1964. See also Trans. IEEE, vol. AS-2, pp. 151-159; April 1964. ABSTRACT NO. 1: Describes briefly two electronic systems which automatically combine several radio interferometer phase channels into one unambiguous channel. This single channel defines the angle of arrival of the radio energy from a satellite in real time. The resolution in determining this angle is proportional to the longest baseline used in the radio interferometer. The principle of operation of the present-day multi-aerial radio interferometer systems remains the same as the early two-element devices. A four-aerial interferometer is considered in this communication. An electronic system using analogue circuitry was designed and built to simplify the data reduction problem; this system is briefly outlined and a photograph of typical recorded output signals is given. ABSTRACT NO. 2: The Naval Space Surveillance System is a multistatic cw radar system using the principle of the radio interferometer. Satellites are located in space by measuring the direction cosines of the reflected radio energy and triangulating from two or more receiving sites. Since the direction cosines are determined by electronically measuring the electrical phase difference between pairs of aerials, it is important to maintain phase coherency between all phase-carrying channels as well as minimizing all differential phase-shifts throughout the post-detection circuits. Characteristics of post-detection filters and phase measuring circuits are discussed in the light of the undesirable incidental phase changes in the system and those caused by phase-rate (the latter being a function of the satellite's relative speed with respect to the surveillance fence). Sensitivity and system error is examined as the phase signals are traced through wide- and narrow-band post-detection filters. Some work on the affect of "phase jump" on the system is also considered as simple circuits are stimulated by a sudden change in phase. (a_1-3, a_2-3, b-1, c-1, d-1, e-0, f-Descriptive survey)

4976. LYNCH, W. M., PRIEDIGKEIT, J. H., KEENAN, M. G., AND SKLAR, H., "Airborne Position-Location Techniques Study," Stanford Research Institute, Menlo Park, California, Project No. 5A6-41503-D911, Contract No. DA 36-039-AMC-03393(E), ASTIA No. AD-354 125; April 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4977. BITTERLICH, W., "Field Strength Meter for VLF Waves," Innsbruck University, Innsbruck, Austria, Report No. 8, Contract No. AF 61(052)490, ASTIA No. AD-603 047; 1 April 1964. ABSTRACT: A small easily portable nuvistorized field strength meter for the frequency range of 1.9-25 kc/sec is described. The antenna consists of a ferrite rod, approximately 1 m long, covered with metal windings. Special attention was paid to a high sensitivity at a large signal-to-noise ratio. (a-1, b-3, c-8, d-16, e-0, f-Description)

4978. WAIT, J. R., "Influence of a Circular Ionospheric Depression on VLF Propagation," National Bureau of Standards, Central Radio

Propagation Laboratory, Boulder, Colorado, ASTIA No. AD-443 543; 1 April 1964. ABSTRACT: Propagation of VLF radio waves in the earth-ionosphere waveguide is considered for the situation where the ionosphere is depressed over a circular region. Using first-order scattering theory, expressions for the expected field perturbations are developed in the form of double integrals. In a number of important special cases, these are expressed in closed form. In certain other situations, the integrations are carried out by numerical methods. The results confirm that a localized ionospheric depression may modify the received field even though the ionosphere along the great circle path is undisturbed. (a-1, b-3, c-1, d-1, e-0, f-Theory)

4979. JOHNSON, P. B., "Analysis of the Spiral Antenna Direction Finder," Harry Diamond Laboratories, Washington, D.C., Project No. 26100, ASTIA No. AD-601 733; 20 April 1964. ABSTRACT: A study was made of a method previously suggested for constructing a passive direction finder capable of determining the azimuth and elevation of an electromagnetic wavefront. This direction finder consists of a two-wire, Archimedian, spiral antenna and a phase comparator. Angular information of accuracy too low for the intended application is obtained when the theory and experimental data previously presented are used. A general theory for the direction finder is established and methods for accuracy improvement are suggested. (a-1, b-3, c-1, d-1, e-0, f-Study)

4980. TROLL, W. C., "Homing on Communications Sources," Bendix Corporation, Southfield, Michigan, Report No. 2587, Contract No. AF 33(657)11751, ASTIA No. AD-349 685; 20 April 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4981. ANONYMOUS, "Phased Array Study," Hughes Aircraft Company, Fullerton, California, Project No. SR0080302, Contract No. NObsr-89427, ASTIA No. AD-601 203; 28 April 1964. ABSTRACT: The transformed switch phase bit circuit has been improved to yield constant phase across the 10-percent band for all four phase bits. Circuit analysis and design are discussed. The antenna array has been optimally matched for scan angles between ±60 degrees. The power distribution system for the array has been analyzed for frequency sensitivity. Fabrication of all parts is complete and parts are now being assembled. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4982. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," Electrical Engineering Research Laboratory, University of Illinois, Urbana, Illinois, Report No. 19, Contract No. DA 36-039-AMC-03720(E), ASTIA No. AD-449 490; 30 April 1964. ABSTRACT: The purpose of the contract is to continue and extend the studies and investigations which will lead to the design of radio direction finding systems (and radiolocation systems) for the MF-HF-VHF range in accordance with specified requirements. Studies and investigations are being continued and extended under two tasks entitled: Radio direction finder and radiolocation systems engineering, and radio propagation and radiolocation research. Progress under each Task has been made and is described. (a-1, b-3, c-1, d-1, e-726, f-See Abstract No. 4929)

4983. ANONYMOUS, "Survey of Marine Electronic Equipment," Brit. Commun. Electronics, vol. 11, no. 5, p. 328; May 1964. ABSTRACT: This survey of British-made equipment is principally concerned with communication, navigation and radar systems and is confined to shipborne equipment. In general, it has attempted to cover the range of equipment which is normally accepted as being electronic in character. The charts are a representative survey of the wide range of marine electronic equipment which is now being made in Great Britain. (a-3, b-2, c-1, d-5, e-0, f-Survey)

4984. ANONYMOUS, "HF Doppler Studies," J. Res. Nat. Bur. Stand., vol. 68D, no. 5, p. 594; May 1964. ABSTRACT: The ionospherically-induced frequency variations of ionospherically-propagated HF signals have been studied by several authors (Watts and Davies, 1960; Fenwick and Villard, 1960; Davies, 1962; Davies, Watts, and Zacharisen, 1962). The method typically involves recording the frequency difference existing between a very stable local oscillator and the ionospherically-propagated signal from a very stable transmitter (for example, WWV). These studies have shown that it is possible to identify regularly occurring frequency changes (upward in the sunrise hours, downward in the sunset hours) associated with the growth and decay of the ionospheric electron density. In addition, pronounced frequency changes have been found associated with solar flares, magnetic sudden commencements and magnetic storms, and ionospheric "ripples." By using simultaneous observations on several different frequencies, it has been possible to make deductions concerning the height of the changes in ionization responsible for the fluctuations in frequency. At times it is possible to identify different ionospheric propagation modes for a single transmission (such as the high and low rays) by the difference in observed frequencies. (a-1, b-1, c-1, d-1, e-0, f-Short article, primarily bibliographical reference)

4985. BUCK, R. H., AND FRANCESCHINI, J. B., "The Design, Fabrication and Installation of a Wire-Grid Lens for HF Radio Direction Finding," Technical Research Group, Menlo Park, California, Report No. RADC TDR64 52, Contract No. AF 30(602)3110, ASTIA No. AD-446 422; May 1964. ABSTRACT: The purpose of this work was to design, fabricate and install an HF wire-grid lens direction finder system. Pertinent results of pattern measurements and adjacent feed signal comparisons made on the 600-foot wire-grid lens on Molokai are included. These provide full-scale evidence of the soundness of the theoretical design and provide a high degree of confidence as to the future success of this direction finder application. Design of the wire-grid lens antenna is complete from the electrical engineering standpoint. Structural design is nearing completion. An analysis of the inherent error of the electronic system is made. Maximum design errors are allocated to those portions of the system which contribute to the over-all system error. All critical portions have been breadboarded to ascertain feasibility. In addition, an analysis of the system scan rate has been made to determine the maximum practical value in terms of the signal character and environment in the 10-50 Mc band. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

4986. BURTNYK, N., MCLEISH, C. W., AND WOLFE, J. L., "A Wide Aperture Sampling Linear Array for Direction Finding," Trans. IEEE, vol. AP-12, no. 3, p. 248; May 1964. ABSTRACT: A method of direction finding by sampling and storing the relative phase and amplitude of the signal received at the elements of an array of many wavelengths aperture is described. If the wave interference field set up by sky waves moves slowly relative to the time of acquiring the samples through a single receiving channel, then the interfering modes may be resolved, as in a beamed array, by combining the samples in a computer. The direction of only the dominant mode can be determined when wave interference fading is relatively rapid. By correlating the outputs of the scanning receiver and a reference receiver, the effective bandwidth of the system can be determined in the latter by the desired carrier spectrum rather than by the scanning rate. An analysis is made of the error in a randomly fading field. (a-1, b-1, c-1, d-1, e-694, f-Description)

4987. HARRINGTON, R. R., "Magnetic Components Radiated by a Horizontal Dipole at VLF," Navy Electronics Laboratories, San Diego, California, Research Report, ASTIA No. AD-602 804; May 1964. ABSTRACT: The electromagnetic radiation characteristics of a horizontal VLF antenna near a semi-infinite conducting plane along its perpendicular bisector were examined. An expression was developed for the electromotive forces induced in vertical loop antennas by the surface and downcoming sky waves along the perpendicular bisector. A simple expression for the ratio of these emf's involves the ground distance from transmitter to receivers, the angle of incidence of the wave on the ionosphere, and the ionospheric reflection coefficient. The effects of nonhomogeneous ground conductivity were also examined and were found to influence the magnitude of the ratio of surface wave field to sky-wave field. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

4988. KING, R. W. P., AND SANDLER, S. S., "The Theory of Broadside Arrays," Trans. IEEE, vol. AP-12, no. 3, pp. 269-276; May 1964. ABSTRACT: The general King-Sandler array theory examined in detail for the case of broadside arrays. Since it is not necessary to assume identical current distributions on every element in the array, a distinction is made between specified base currents and voltages. The driving-point impedances for specified base currents and voltages are presented for arrays of up to 25 elements. The effect of interaction between the element currents in the base inpedances and radiation patterns is clearly shown for the broadside array. The results indicate that the major effect of unequal current distributions in the broadside array is to cause important variations in the driving point impedances and little effect in the radiation patterns. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4989. KING, R. W. P., AND SANDLER, S. S., "The Theory of Endfire Arrays," Trans. IEEE, vol. AP-12, no. 3, pp. 276-280; May 1964. ABSTRACT: The general King-Sandler array theory is examined in detail for the case of endfire arrays. Since it is not necessary to assume identical current distributions, a distinction is made between specification of the base voltages and currents. The driving-point impedances for specified base voltages and currents are presented for arrays of up to 25 elements. The effect of interaction between the

element currents in distorting the radiation pattern is shown for the 15-element endfire array. The results indicate that the unequal current distributions have a pronounced effect in determining the driving-point impedances, sidelobe levels and back-to-front ratios of endfire arrays. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4990. KING, R. W. P., "Theory of the Terminated Insulated Antenna in a Conducting Medium," Trans. IEEE, vol. AP-12, no. 3, pp. 305-319; May 1964. ABSTRACT: The general problem of the insulated antenna in an isotropic homogeneous medium of infinite extent is reviewed under the assumption that the medium is sufficiently conducting to permit the application of coaxial line theory. The currents and associated electromagnetic fields for the completely insulated antenna are obtained and the directional properties of the latter explained by comparison with a collinear array. An antenna in which only a central portion is insulated, while the ends are bare, is analyzed in terms of the theories of the insulated and bare antenna, both when the structure is driven by generators at the junctions of the bare and insulated sections and when it is driven by an internal coaxial feeder in the manner of a sleeve dipole. Finally, the center-driven insulated antenna with bare ends is investigated and its field is compared with that of the antenna driven at the junctions of the bare and insulated sections. (a-1, b-1, c-1, d-1, e-0, f-Theory and analysis)

4991. PAO, C., "Polarimeter: A Study of the Polarization of Radio Wave Reflection in the Ionosphere, I," Emmanuel College, Boston, Massachusetts, Research Language Center, ASTIA No. AD-611 034; May 1964. ABSTRACT: This paper outlines the fundamental theory of design and the principal circuits of the instrument, and discusses in detail such complicated problems as the shielding of the antenna and feeder, the various requirements for the twin-channel pulse receiver and the special circuits of the indicator. It also discusses the range of measuring errors. (a-3, b-3, c-1, d-24, e-0, f-Translation of Wu Han Ta Hsueh: Tzu Jan K'o Hsueh Hsueh Pao [Chinese People's Republic]; 1957, no. 2, pp. 103-118)

4992. WHITESIDE, H., AND KING, R. W. P., "The Loop Antenna as a Probe," Trans. IEEE, vol. AP-12, no. 3, pp. 291-297; May 1964. ABSTRACT: The properties of circular and square loop antennas as probes for measuring the magnetic field are investigated. The response of an electrically small loop to the magnetic and the electrical components of a given electromagnetic field is determined theoretically for singly- and doubly-loaded loops in terms of suitably defined constants. A system error ratio is defined as a measure of the ability of a given probe to discriminate against the effects of the electric field. An experimental procedure for measuring loop sensitivities in the elliptically polarized near field of a quarter-wave monopole is concluded that very large errors are possible when a singly-loaded loop is used to measure magnetic fields its diameter is less than 0.01 λ. The doubly-loaded probe may be used with comparable accuracy when its diameter is as large as 0.15 λ. (a-1, b-1, c-1, d-1, e-0, f-Theory)

4993. HARRINGTON, P. R., "Magnetic Components Radiated by a Horizontal Dipole at VLF," Navy Electronics Laboratory, San Diego, California, Project No. SR 008-01-01, ASTIA No. AD-602 804; 4 May 1964. ABSTRACT: The electromagnetic radiation characteristics of a horizontal vlf antenna near a semi-infinite conducting plane along its perpendicular bisector were examined. An expression was developed for the electromotive forces induced in vertical loop antennas by the surface and downcoming sky waves along the perpendicular bisector. A simple expression for the ratio of these emf's involves the ground distance from transmitter to receivers, the angle of incidence of the wave on the ionosphere, and the ionospheric reflection coefficient. The effects of nonhomogeneous ground conductivity were also examined and were found to influence the magnitude of the ratio of surface-wave field to sky-wave field. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

4994. WILLIAMS, C., "Improved Transportable H.F. Direction Finder Set," Servo Corporation of America, Hicksville, New York, Quarterly Progress Report No. 1, Contract DA 36-039-AMC-03706(E), ASTIA No. AD-447 131; 11 May 1964. ABSTRACT: Efforts concern the study, design and construction of a development model of an improved transportable HF direction finder set. The objective of this equipment is to obtain bearings on all signals presently being transmitted in the HF band by incorporating both the Doppler and Adcock modes of operation. Doppler operation will be from 1.5 Mc to 10 Mc and Adcock operation from 10 Mc to 20 Mc with satisfactory operation down to 1.5 Mc. This will be accomplished with two concentric antenna arrays: one for Doppler operation and one for Adcock operation. The Doppler system will be instrumented to readout both azimuth bearing and elevation angle. The independent operating positions will be supplied each containing an azimuth indicator, receiver, data extractor, elevation readout and propagation monitor. The antenna development program is described. Designs of the data extractor, azimuth indicator and motor power amplifier are presented. (a-1, b-3, c-1, d-1, e-701, f-Study and investigation)

4995. KUHL, H., "Methods of Radiolocation," Elektrotech. Z. (ETZ), A, vol. 85, no. 11, pp. 346-349; 29 May 1964. ABSTRACT: The wireless fix gains more and more importance in sea and air navigation, and lately especially in space travel. Its more important feature is that it is always available, in darkness, in cloud and fog. The actual method must be chosen in accordance with the required accuracy. The use of methods involving wireless means is called radiolocation. The problems and the possible applications are discussed, particularly determination of direction and distance. Physical considerations governing the choice of suitable frequency range are given. Ideas on further development of the method are outlined. (a-3, b-1, c-4, e-4, e-0, f-Description)

4996. PAYNE, D. V., "Study of Advanced Passive Homing Techniques," Bendix Corporation, Southfield, Michigan, Report No. 6, Contract No. AF 33(657)8979, ASTIA No. AD-351 639; 31 May 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4997. SHERRILL, W. M., AND TRAVERS, D. N., "AN/SRD-14 Bearing Tests and Nonrotating Spaced Loop Direction Finder Development," Southwest Research Institute, San Antonio, Texas, Project No. SF 0010801, Contract No. NObsr-89167, ASTIA No. AD-602 118; 31 May 1964. ABSTRACT: A demonstration of the AN/SRD-14 direction finder was carried out. Bearing and sense performance data over the 100 kc to 4 mc range were obtained with the result that ±5 deg error calibration curves were obtained for 90% of the frequencies tested. Direct sense was observed from 0.2 to 2 mc above which sense was reversed. Modification of the sense antenna circuits is indicated. Modification and testing of the nonrotating spaced loop D/F system showed that ±5 deg error performance was achieved without sense reversal from 2-30 mc. A two-mc range from 25-27 mc encompassing the series resonance of the antennas showed degraded performance and indicates the need of reducing antenna size to shift the resonance out of the operating range. Bearing sensitivity of the twin and goniometer channels was equal within ±2 db. Progress in developing methods of using the HP5100 - 5110A synthesizer for rapid programmed tuning of a twin channel receiver is described. Operation of the synthesizer with the Racal RA.153 and Intercept Research IR-3 receivers is described. (a-1, b-3, c-1, d-1, e-1000, f-See Abstract No. 4943)

4998. ANONYMOUS, "Position Determining Measurements Using Time Difference Techniques," ITT Federal Laboratories, Nutley, New Jersey, Contract No. NObsr-77558, ASTIA No. AD-351 664; June 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

4999. JONES, E. M. T., AND FRANCESCHINI, J. B., "The Design, Fabrication and Installation of a Wire-Grid Lens for HF Radio Direction Finding," Technical Research Group, Menlo Park, California, Quarterly Report No. 3, Report No. RADC TDR64 171, Contract No. AF 30(602)3110, ASTIA No. AD-442 465; June 1964. ABSTRACT: The purpose of the work being reported herein is to design, fabricate and install an HF wire-grid lens direction-finder system. The wire-grid lens D/F antenna operates over the 10 to 50 mc band and utilizes 36 feeds to cover the full 360 degrees of azimuth. The lens has a diameter of 305 feet. The 61.5-foot long radial matching horn which surrounds the lens increases the overall antenna diameter to 428 feet. The vertical aperture of the horn is 45 feet. Both the structural and electrical design of the antenna are complete. The fabrication of the electronic DF circuitry is nearly complete. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4985)

5000. MARCHAND, N., "Error Distributions of Best Estimate of Position from Multiple Time Differences Hyperbolic Networks," Trans. IEEE, vol. ANE-11, no. 2, p. 96; June 1964. ABSTRACT: A mathematical model for the error distribution of the best estimate of position of a vehicle as determined from a set of simultaneous measurements of times of arrival of electromagnetic waves from an arbitrary number of ground stations is obtained. The major and minor axes of the error ellipse, as well as the angle that they make with the assumed axes, are determined. The results are in such form as to be easily adaptable for use with a computer. The purpose of this paper is to obtain a mathematical model of the best estimate of position, and the theoretical two-dimensional error distribution of this best estimate of position, of a vehicle as determined from a set of simultaneous time measurements of distances determined by electromagnetic wave times of arrival to (or from) an arbitrary number of ground stations. Since the problem

here is one of time-difference hyperbolic lines of position, the minimum number of fixed ground stations is three, provided that they are not located on a straight line. There is no maximum number for the number of stations in the network. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

5001. ORE, F., "Experimental Study of Mutual Coupling between Elements of a Wide Aperture Radio Location Antenna," Illinois University, Engineering Experiment Station, Urbana, Illinois, Report No. 3, Contract NObs-89229, ASTIA No. AD-603 196; June 1964. ABSTRACT: This investigation demonstrated some of the effects of mutual coupling on the impedance characteristics of an element of the large circular array being considered. It was shown that the minimum practical spacing between phase centers of adjacent elements of the array is on the order of 3/16 lambda with an even wider spacing being desirable. In addition, the investigation showed that the impedance characteristics of an element are severely deteriorated over approximately a 15 percent band just below the frequency where a new band is to begin. Since the completion of this investigation, a combination theoretical and experimental investigation has been conducted on a 500:1 scale pattern model to determine a low frequency limit element spacing based on acceptable radiation pattern performance. (See AD-429 235) Thus, from this impedance investigation and from the pattern investigation, it would appear that the low frequency limit adjacent phase center spacing must be on the order of .175 lambda if the acceptable pattern performance with the impedance performance as described is to be achieved. (a-1, b-3, c-1, d-1, e-0, f-Study)

5002. PALLUCONI, B. B., "Bibliography on the Ionosphere and Upper Atmosphere 1961-1963," Technical Information Center, HRB-Singer, Inc., ASTIA No. AD-441 450; June 1964. ABSTRACT: The amount of literature published on the ionosphere and upper atmosphere is vast and increases each year. This bibliography covers a period of approximately three years. There are over 1700 references and this is by no means comprehensive. This is in part an effort to update Laurence A. Mannings, "Bibliography of the Ionosphere" which covers the period from about 1925 through 1960. These references were compiled from "Physics Abstracts," in which there is a time lag between the publication of a paper and its ultimate inclusion in "Physics Abstracts." Therefore the majority of papers published in 1961 through 1963 have been included, with the exception of those published late in 1963. (a-1, b-3, c-1, d-1, e-0, f-Bibliography)

5003. PAVEY, N. A. D., "A Multi-Beam 3-Band Aerial Array for Broad-Band Direction Finding," Royal Aircraft Establishment, Farnborough, England, Report No. TN RAD867, ASTIA No. AD-453 268; June 1964. ABSTRACT: Broad-band microwave direction-finding using multi-channel amplitude-comparison techniques is discussed with particular reference to the feasibility of generating multiple aerial beams with suitable properties from a single linear array. It is shown that in principle the beam directions may be made frequency invariant by suitable feeder network design, provided that the sum of the beam gains does not exceed the array gain. The design of a 32-element, 6-beam array is considered for direction-finding in an 8 degree sector over the frequency band 2.5 to 4.1 Gc/s, and it is shown that impedance mismatches result in a degradation of performance. A D/F accuracy of the order of 0.2 degrees rms and a sidelobe level of -25 dB are considered to be feasible. (a-1, b-3, c-1, d-5, e-0, f-Analysis)

5004. RYAN, H. F., "An Analysis of a Variable Rate Servomechanism for a Radio Direction Finding System," Electrical Engineering Laboratory, University of Illinois, Urbana, Illinois, Project No. NR371 161, Contract No. Nonr-1834-02, ASTIA No. AD-603 223; June 1964. ABSTRACT: A detailed analysis of an ac rate servomechanism is presented. The actual performance of the servo is compared to the desired performance. Two mathematical models of the servo are constructed from experimental data. The first model is the usual linear model using Laplace transforms; the second model is a quasi-linear model which includes a describing function representing the acceleration limiting of the servomotor. From the models the sensitivity and stability of the servomechanism are calculated. Certain limitations of the models are pointed out. A large amount of experimental data is presented in graphical form. (a-1, b-3, c-1, d-1, e-0, f-Analysis)

5005. SALOMONOVICH, A. E., BRAUDE, B. V., AND ESEPKINA, N. A., "Measurement of High-Directional Aerial Parameters in the Near-Field Zone," Radiotekhnika i Electronika, vol. 4, no. 6, pp. 1069-1072; June 1964. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-Measurements)

5006. MOORE, J. D., LAENGER, C. J., AND TRAVERS, D. N., "Portable Spaced-Loop Antenna," Southwest Research Institute, San Antonio, Texas, Quarterly Progress Report No. 3, Contract No. DA 36-039-AMC-03405(E), ASTIA No. AD-450 985; 30 June 1964. ABSTRACT: Efforts were continued on research studies and theoretical investigations to determine the feasibility and limitations of utilizing a small spaced-loop antenna for portable and mobile landbased direction finders in the 20 to 150 mc frequency range. The computer program for the theoretical coaxial spaced-loop antenna and sense patterns was clarified. The nulls of the simple loop pattern and the simple loop nulls of the coaxial spaced-loop pattern agree in position for all polarizations. Field sense tests have verified the theoretical calculations. The most difficult signal polarizations to sense are those conditions of linear polarization which produce very small displacements between the spaced-loop nulls and the simple loop nulls of the coaxial spaced-loop pattern. (a-1, b-3, c-1, d-1, e-1000, f-See Abstract No. 4970)

5007. BRICE, N., "Electron Density and Path Latitude Determination from VLF Emissions," Stanford Electronics Laboratories, Stanford University, Stanford, California, AF 49(638)1060, ASTIA No. AD-617 851; July 1964. ABSTRACT: A new technique has been developed for determining noise frequencies and time delays at the noise frequency for propagation paths in the outer magnetosphere. The computed normalized whistler shape is plotted on a log-log scale, allowing the noise frequency and noise time delay to be found very simply by an overlay method from measurements of time delays at any two other frequencies. The versatility and simplicity of this method make it particularly suited for use with periodic vlf emissions. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

5008. BROWN, R. G., AND LAMB, H. L., "NAS Chart Overlays for the System Design Team, Supplement No. 2," Federal Aviation Agency, Washington, D.C., ASTIA No. AD-607 247; July 1964. ABSTRACT: Supplement No. 2 is the second addition to the memorandum report, NAS chart overlays for the system design team, July 1963. Reproductions of four additional NAS overlays and eight administrative overlays are presented. The administrative overlays describe the various offices and related boundaries of the Federal Aviation Agency within the continental United States. (a-1, b-3, c-1, d-1, e-0, f-Charts)

5009. DURRANI, S. H., "Air to Undersea Communication with Magnetic Dipoles," Trans. IEEE, vol. AP 12, no. 4, p. 464; July 1964. ABSTRACT: Simplified expressions are derived for the electromagnetic fields produced by a vertical or horizontal magnetic dipole (loop antenna) located in air above the sea. The expressions hold over the quasi-near range in both media subject to certain mild restrictions. The solutions are obtained by first applying the boundary conditions to determine the magnetic Hertz potential $\bar{\pi}^*$ in the form of Sommerfeld integrals, and then relating these to two auxiliary integrals U, V and their derivatives, asymptotic series for which are obtained by extending the work of Baños and Wesley. The horizontal magnetic dipole (loop in the vertical plane) is found to be superior to the vertically-oriented dipole of the same size and excitation from the point of view of field strength induced in the sea at large distances from the source. A comparison with previously published results for the electric dipole shows the magnetic dipole to be better, provided the number of turns in the loop exceeds a certain minimum. An approximate analysis on the basis of equal powers also shows the magnetic dipole to be better except for points near the outer rim of the quasi-near range, where the two types of dipoles are equivalent. (a-1, b-1, d-1, d-1, e-0, f-Theory)

5010. JONES, E. M. T., AND FRANCESCHINI, J. B., "The Design, Fabrication and Installation of a Wire-Grid Lens for HF Radio Direction Finding," Technical Research Group, Menlo Park, California, Interim Report No. 4, Contract AF 30(602)3110, ASTIA No. AD-451 083; July 1964. ABSTRACT: Efforts concern a program to design, fabricate and install an HF wire-grid lens direction finder system. The wire-grid lens D/F antenna operates over the 10 to 50 mc band and utilizes 36 feeds to cover the full 360 degrees of azimuth. The lens has a diameter of 305 feet. The 61.5-foot long radial matching horn which surrounds the lens increases the over-all antenna diameter to 428 feet. The vertical aperture of the horn is 45 feet. The erection of the antenna was completed. The ramp and dipole portion of the thirty-six feeds were installed. The D/F electronics circuitry was also completed and bench tested. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4999)

5011. KING, R. W. P., HARRISON, C. W., AND TINGLEY, D. G., "The Admittance of Bare Circular Loop Antennas in a Dissipative Medium," Trans. IEEE, vol. AP-12, no. 4, p. 434; July 1964. ABSTRACT: The normalized input admittance of thin bare circular loop antennas has been evaluated from the theory of T. T. Wu.

computations have been made for loops in air and in an infinite homogeneous isotropic dissipative medium. A comparison is also made with Storer's theory of the loop. Numerical results are given in the form of graphs for several wire sizes and for loops up to two and one-half wavelengths in circumference. The properties of the medium are represented by the ratio α/β in the range from zero (perfect dielectric) to one (good conductor); α and β are the imaginary and real parts of the complex propagation constant $k = \beta - j\alpha = \omega\sqrt{\mu(\epsilon - j\sigma/\omega)}$ where μ is the permeability, ϵ the dielectric constant, and σ the conductivity of the medium. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

5012. COPELAND, J. R., AND ROBERTSON, W. J., "An Elementary Integrated Direction-Finding System," Ohio State University Research Foundation, Columbus, Ohio, Antenna Laboratory, Report No. 1566-12, Contract No. AF 33(657)10386, ASTIA No. AD-444 523; 1 July 1964. ABSTRACT: A simple, 1000 Mc direction-finding or homing system is described. The system operates by simultaneous lobe-switching in the horizontal- and vertical-planes. Lobe-switching is accomplished by an integral design of the video detector, asymmetrical feed, and diode-switched delay line, incorporated into a log-periodic dipole array, the two halves of which are layered diametrically opposing, onto the inside surface of a transparent glass cone. The switch-drive, amplifiers, and readout display are located in an external control box. Angular coverage of the direction-finder is approximately an 80 degree cone surrounding the nose-on symmetry axis, with some minor irregularities in the off-axis calibration. Causes and cures of the irregularities are discussed, along with the improvement that could be obtained with an effective automatic gain control. (a-1, b-3, c-1, d-1, e-0, f-Description)

5013. PADHI, T., "The Theory of Coil Antennas," Cruft Laboratories, Harvard University, Cambridge, Massachusetts, Report No. TR-442, Contract No. Nonr-1866-26, Project No. NR371-015, ASTIA No. AD-607 093; 1 July 1964. ABSTRACT: In this report, a method was presented by which the distribution of current on some structurally simple coil or multiturn loop antennas may be obtained. The input admittances of unshielded and shielded coils were determined and their operation as receiving elements was considered. (a-1, b-3, c-1, d-1, e-0, f-Theory)

5014. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products, Inc., Mountain View, California, Report No. 64R25, Project No. SS024-001, Contract No. NObsr-89237, ASTIA No. AD-351 904; 15 July 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4965)

5015. BAILEY, A. D., DYSON, J. D., AND HAYDEN, E. C., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Electrical Engineering Research Laboratories, Urbana, Illinois, Final Report No. 20, Project No. DA 36-039-AMC-03720(E), ASTIA No. AD-453 179; 31 July 1964. ABSTRACT: The purpose of the contract was to continue and extend the studies and investigations which lead to the design of radio direction finding systems (and radiolocation systems) for the MF-HF-VHF range in accordance with specified requirements, studies and investigations were continued and extended under two tasks entitled: Radio direction finder and radiolocation systems engineering, and radio propagation and radiolocation research. Progress was made under each task. The results of one year of operating experience with the HF system have been summarized. In particular, the significance of the measurement of elevation angle of arrival, and the use of ionosondes and a digital computer in the determination of distance in intermediate range radiolocation are presented. (a-1, b-3, c-1, d-1, e-777, f-See Abstract No. 4982)

5016. PICKENS, R. A., LYONS, B. J., AND VOGT, G. L., "Wide Band Phased Arrays," Bendix Radio Division, Bendix Corp., Baltimore, Maryland, Semiannual Report, Contract No. AF 30(602)3028, ASTIA No. AD-352 211; 31 July 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5017. HAWLEY, C. J., "Permanent Recorder for Radio Direction Finding CRT Bearing Display Units," University of Illinois, Engineering Experiment Station, Urbana, Illinois, RRL 251, Contract No. DA 36-039-AMC-03720(E), ASTIA No. AD-606 983; August 1964. ABSTRACT: A Watson-Watt type matched twin-channel system for radio direction finding that permits permanent recordings from cathode ray tube bearing display units is described. This system employs a crossed array of four vertical antennas, and a versatile recorder that can record from any CRT display using a line or tip trace from some angle with the vertical axis. The radio receiver processes the N-S information to the vertical deflection plates of a cathode ray tube and the E-W signal to the horizontal plates resulting in a single component signal. Usually more than one signal is received due to multipath propagation resulting in an ellipse trace whose major axis is at best lined up at the desired angle with the vertical. (a-3, b-3, c-1, d-1, e-735, f-Description)

5018. ROLLIN, R. A., JR., DOSS, H. W., JR., SMITH, E. H., AND CLINE, R. E., "Investigation of Precision Position Determination by Distance-Measuring Techniques," University of Michigan, Institute of Science and Technology, Ann Arbor, Michigan, Report No. 2900-453T, Contract No. DA 36-039-sc-78801, ASTIA No. AD-445 290; August 1964. ABSTRACT: An exploratory investigation study and analysis of precision position determination by distance-measuring techniques has been conducted. This report reviews physical principles, electronic methods, and modern oscillators as they apply to real-time coordination in relative frameworks. A quadrangulation system is proposed and formulated as a mathematical model on an LGP-30 computer. The model includes a preliminary error analysis. A balanced experimental and analytical program is outlined toward realization of very precise position determination in order to impose implicit calibration upon signals that have undergone atmospheric refraction. (a-1, b-3, c-1, d-1, e-0, f-Study and analysis)

5019. SHOCKLEY, T. D., "Radiation Fields of a Loop Antenna," Proc. IEEE, vol. 52, no. 8, p. 970; August 1964. ABSTRACT: The near and far field equations of the circular loop antenna may be derived by boundary value techniques as well as by direction integration. It is assumed that the thin wire, single turn circular antenna is located in the xy plane with its center at the origin and that it is excited by a uniform in-phase sinusoidal current. From the symmetry of the loop current, it is evident that the E field will have only a ϕ component and that the field will be transverse electric (TE) to r, i.e., $E_r = 0$. (a-1, b-1, c-1, d-1, e-0, f-Theory)

5020. SHERRILL, W. M., "Polarization Measurements of the Decameter Wavelength Emission from Jupiter," Southwest Research Institute, San Antonio, Texas, Final Report, Project No. 06-1359IR; 1 August 1964. ABSTRACT: Measurements of the polarization characteristics of the Decameter λ emission from Jupiter were carried out from 1 September 1963 through 7 January 1964. The expanded two helix polarimeter permitted measurement of axial ratio and polarization fraction of the Jovian bursts in the frequency range 15-24 mc. Systematic measurements were made at 15.2, 16.2, 18.2, 22.2 and 24.2 mc. Right-hand elliptical polarization predominated all frequencies. However, left-hand and random-linear polarization showed increasing incidence as the frequency was reduced below 22 mc. Measurement of polarization fraction indicated 20-50% linear polarization of the random-linear bursts. For the 1963 data, no clearly established change in average axial ratio with System III longitude was observed at frequencies greater than 15 mc. The 15-mc data showed more circular average axial ratio in the source 2 region than for sources 1 or 3. Observation of the incidence of mixed events indicated a tendency towards minimum occurrence near opposition. The axial ratio and polarization fraction data were compared with the predictions of the cyclotron source model. (a-1, b-3, c-1, d-1, e-1000, f-Experimental results)

5021. SHERRILL, W. M., "Polarization and Polarimetry in Radio Astronomy," Southwest Research Institute, San Antonio, Texas, Supplemental Report, Project No. 06-1358IR; 1 August 1964. ABSTRACT: This review summarizes the results of a literature survey conducted in conjunction with the Jupiter polarization observations made under SwRI Project 06-1358IR. It attempts to bring together the diverse literature on polarization measurements and the polarization characteristics of radiation mechanisms encountered in radio astronomy. The polarization characteristics of plasma oscillations, gyrosynchrotron, and Cerenkov radiation are briefly discussed. The derivation of the Stokes polarization parameters is given in some detail, followed by a discussion of the applicability of antenna techniques to their determination. The configurations of fundamental radio polarimeter systems are discussed and the effects of Faraday rotation, dispersion, and other propagation phenomena on polarimeter measurements are outlined. Finally, a brief survey is presented of three significant areas of radio polarization measurements, viz., discrete sources, the Sun, and non-thermal Jupiter emissions. Specific polarization measurements are emphasized to indicate the diversity and precision of current techniques and the astrophysical significance of the measurements undertaken. (a-1, b-3, c-1, d-1, e-1000, f-Summary report. See preceding Abstract)

5022. TRAVERS, D. N., MARTIN, P. E., AND SHERRILL, W. M., "Use of the Beverage Antenna in Wide Aperture High Frequency Direction Finding - Part II: System Design," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. NObsr-89345, ASTIA No. AD-445 116; 1 August 1964. ABSTRACT: Extensive operational tests and measurements have been performed on a circular array of

Beverage antennas with the solid state commutator. Several experimental antenna pattern studies have been made using the AN/FRD-10(X-2) channel watcher D/F set and the commutator. Many experimental patterns and related tests have been completed and compared to theoretically predicted results. Consistent agreement indicates that the mathematical model of the Beverage antenna (developed and discussed in Part IV, this report, March 1964) can be accepted with confidence for both azimuth and elevation patterns. The effects of horizontal polarization upon the apparent azimuthal angle of arrival of a signal have been investigated in some detail. Additional theoretical studies have been made to investigate optimum arraying techniques (including external phasing) for circular arrays of Beverage antennas having a large inner radius compared to the element-length. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5023. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electric Products, Incorporated, Mountain View, California, Contract No. NObsr-89237, ASTIA No. AD-352 613; 15 August 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 5014)

5024. TESO, W. A., "VLF Propagation Studies Based on Phase Comparison Records," Ohio State University Research Foundation, Columbus, Ohio, Antenna Laboratory, Report No. 1116-50, Project No. 5633, Contract No. AF 19(604)7270, ASTIA No. AD-451 666; 15 August 1964. ABSTRACT: The use of records obtained by comparing, as a function of time, the phase of a local atomic standard with that of a received very low frequency radio wave was investigated. These records are now widely used to determine the frequency difference between two atomic standards. The precision of such a measurement is examined from a statistical standpoint in terms of propagation variations to determine the averaging time necessary to realize the optimum level of precision. The best method of analyzing the records is discussed and some experimental results are given. The use of a third station to measure the frequency offset between two separate standards is shown generally to give the most consistent results and highest precision of measurement. (a-1, b-3, c-1, d-1, e-0, f-Thesis)

5025. ELFVING, C. T., "Inherent Errors in a Direction Finding System Using Log Periodic Antennas," Electronic Defense Laboratories, Sylvania Electronic Systems - West, Mountain View, California, Report No. EDL-M738, Contract No. DA 36-039-AMC-03404(E), ASTIA No. AD-460 609; 31 August 1964. ABSTRACT: A study to determine the direction-finding errors inherent in an amplitude-comparison D/F system using log periodic antennas has been conducted. The factors were found to contribute to the errors of the system. One is a small polarization variation with frequency, inherent in the folded log periodic antennas, and the other is the geometry of the D/F antenna system. This report describes the experimental investigation conducted to determine the magnitudes of these effects and shows some of the measured data. (a-1, b-3, c-1, d-1, e-0, f-Study)

5026. ANONYMOUS, "Handbook for D.F. Outfits UA8 and UA9 Maintenance," Admiralty Weapons Department (British), Report No. C.B.-4885(2), ASTIA No. AD-358 639; September 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-5, e-0, f-0)

5027. BURTNYK, N., AND WOLFE, J. L., "High-Frequency Radio Direction Finding," National Research Council of Canada, Radio and Electrical Engineering Division Bulletin, vol. 14, no. 3, pp. 20-27, NASA No. N-65-25020; July-September 1964. ABSTRACT: Most of the energy of ionospherically propagated radio waves is normally received in the form of discrete modes, made up of a small angular spectrum of scattered power about a spectral component of wave energy. Several of these modes may be presented at once, with relative strengths that are often comparable, and their interference pattern creates severe deviations of the phase of the field at the receiving antenna from that determined by a single plane wave. The information about the angular spectrum is contained in the space correlation of the field, and can be recovered only by sampling at many points over a wide area. A design procedure for a radio direction finder using a widely spaced interferometer system has been presented by the author. Since the instantaneous phase between two elements constitutes but a single space sample, the simple interferometer cannot resolve the angular spectrum of incoming energy. It can be used, however, to produce an estimate of the most likely direction of arrival. The error of this estimate can be reduced by employing time-averaging to allow the antenna to sample different portions of the moving diffraction pattern. The mean phase observed will be that of the consistently dominant mode. If mode change-over occurs during the averaging period, the mean phase is weighted towards the center of the angular spectrum. An important problem associated with the simple interferometer of many wavelengths spacing is the resolution of the phase ambiguity of the wide aperture from observations with the narrow aperture. Resolution differs under severe wave interference conditions, and therefore time-averaging techniques must be used. Thus the probability of failure to resolve the wide-aperture phase is an important characteristic of the interferometer performance. A crossed interferometer of 122.5-meter spacing has been built and tested. A brief evaluation of the performance is presented. Phase readings on each of the two narrow-aperture and wide-aperture pairs were obtained in terms of digitized voltages proportional to the sine and cosine of phase. These were processed by computer to determine the statistical performance of the system. (a-1, b-3, c-1, d-7, e-0, f-Description)

5028. CHU, C., HOK, G., AND LARUE, J. J., "Ionospheric Disturbances and Their Effects on the Propagation of HF Electromagnetic Waves," Radiation Laboratory, University of Michigan, Ann Arbor, Michigan, Project No. 4649, Contract No. AF 19(604)7257, ASTIA No. AD-609 085; September 1964. ABSTRACT: This report is concerned with the effect of ionospheric disturbances on HF radio waves whose propagation path is at a large distance from the source of the disturbance. The perturbation of the HF radio waves is assumed to be due to mechanical waves propagating in the atmosphere. The microscopic equations governing the propagation of mechanical waves in the atmosphere, including the effects of viscosity and thermal conductivity, are developed. A simple model of the atmosphere is proposed and a technique, suitable for numerical analysis, is developed for determining the various modes propagating. The effect of the earth's magnetic field on the propagation of mechanical waves is evaluated and it is concluded that this effect is small. The modification of the disturbance due to the presence of charged particles is discussed in conjunction with a comparison of the microscopic and macroscopic formulation of the equations of motion. An idealized description of the source is given in the appendix and some solutions to some simple problems are discussed. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

5029. DAVIES, D. E. N., AND RAO, B. S., "Studies of a Twin-Channel Frequency-Modulated Echo-Location System," The Radio and Electronic Engineer, vol. 28, no. 3, pp. 161-172; September 1964. ABSTRACT: This paper describes theoretical and experimental studies of a proposed twin-channel echo-location system using frequency-modulated transmissions, in terms of its possible application to primary-radar systems or target-tracking systems. The proposed system can measure the range and bearing of a target from a fixed aerial system, although in the presence of multiple targets, ambiguities of target position restrict its performance. The system may be adapted, however, for accurate tracking of a target containing a suitable signal source. (a-1, b-1, c-1, d-5, e-730, f-Study and investigation)

5030. DIAMANTIDES, N. D., "Quantization, Statistics and Matching of Maps and Pictures," Trans. IEEE, vol. ANE-11, no. 3, p. 180; September 1964. ABSTRACT: Picture processing and alteration for the purpose of quantification and map matching are discussed and the mathematics thereof derived. The statistics of such pictures, reduced to a black-and-white state, are developed. The theoretical derivation of the autocorrelation and crosscorrelation of any two-level pictures is described on the basis of their measured statistics. The importance of such correlation to scene classification and to map matching for the purposes of navigation and homing guidance is shown. The effects of various types of noise that may corrupt one or both copies of the pictures to be correlated are assessed. Finally, the validity of the theory is demonstrated by applying it to specific cases of synthetic radar maps as well as to other displays. (a-1, b-1, c-1, d-1, e-0, f-Theory and statistics)

5031. ERNST, E. W., MCCLURG, W. C., AND MILLER, L. J., "Antenna Array Evaluation System," Radiolocation Research Laboratory, Department of Electrical Engineering, Engineering Experiment Station, University of Illinois, Urbana, Illinois, Report No. 9, Contract No. NObsr-89229, ASTIA No. AD-607 509; September 1964. ABSTRACT: The Wullenweber RDF system includes a multi-element antenna array. This array consists of a large number of identical elements uniformly distributed about the circumference of a large circle. Each antenna is connected by a transmission line to a central point of the array where the outputs of the antennas are combined to give the desired directional characteristic to the array. The Wullenweber array at the University of Illinois is composed of 120 elements on a circle whose diameter is about 1000 feet. The evaluation of the characteristics of such an array is difficult at best. When the evaluation is to include the characteristics over a wide range of frequencies (2-32 mcps) new techniques and equipment are needed. One of the characteristics to be evaluated is the pattern of an individual element. That is, the response of the element to a source as the azimuth (or elevation) to the source

is changed. In principle, this can be done by moving the source so as to maintain constant distance from the center of the array, continually changing the angle involved, and noting the response from the antenna. The difficulty of maintaining a constant distance, the problem of changes in other parameters during the time involved, and the effects of difference in the terrain in the different directions make this approach impractical. The other common approach, that of rotating the array, is likewise impractical because of the size of the array. The approach which has been followed is to connect the antenna sequentially, to a receiver while the source remains essentially fixed in location. Thus, since the elements are (to a first approximation) identical, the effect is that of "rotating" the array. The sequential connection of the elements to the receiver must be done rapidly so the source and other potential variables can be maintained essentially constant during the period of a single rotation. For this purpose, scanning rates typical of goniometer speeds would appear to be appropriate. That is, in the range of 90 to 900 rpm, or 1.5 to 15 scans per second. Rather than use a rotating system, such as a goniometer, a discrete switching system has been devised. To permit the high speed switching necessary, electronic commutation techniques employing semiconductor diodes have been utilized. (a-1, b-3, c-1, d-1, e-953, f-Description)

5032. LONG, W. D., "Luneberg Lens Antenna at Molokai," NRL, Report of NRL Progress. See Department of Commerce PB181566; September 1964. ABSTRACT: A wire-grid lens antenna for operation in the high-frequency range has been designed and constructed at Molokai, Hawaii for the Federal Aviation Agency by TRG-West. The antenna is comprised of three basic elements: the lens, a radial horn, and a feed. The lens is constructed from two circular grids 600 ft in diameter, suspended one above the other and supported by a circular array of 36 treated wooden poles. Each grid is composed of square wire mesh 5 ft on a side. The separation between grids varies from approximately 6 in. in the center to 12 ft at the edge; the center of the lower grid of the lens is approximately 12 ft above ground. A radial horn is attached to the perimeter of the lens, extending from the upper grid approximately 90 ft to 100 ft in the vertical plane and extending from the lower grid to approximately 7 ft above ground level. The radial horn adds 250 ft to the diameter of the lens. The third element in the antenna is the feed which consists of two parallel capacitively loaded ramp feeds spaced 30 ft apart, fed in parallel and extending from the perimeter of the lens approximately 75 ft into the lens. Theoretically, a plane wave entering the lens is focused at a point on the lens diametrically opposite the direction of entry. Such a design enables the installation of a large number of communications circuits using a single lens simply by installing a feed system for a given circuit, provided that sufficient isolation is maintained between feeds. The FAA lens antenna is equipped with seven feed systems to provide circuits between Molokai, Hawaii and stations having the following bearings relative to true north: 5°29', 53°30', 201°46', 213°29', 222°31', 273°29', and 299°29'. A full-scale measurement program to determine the lens characteristics was not planned by the FAA for acceptance testing; however, the FAA was receptive to a proposed evaluation of the lens antenna by the Naval Research Laboratory and permitted the antenna to be used for such an evaluation. After a series of meetings with other agencies interested, the proposed evaluation was designed to serve the interests of several government groups and was termed a joint-services evaluation. Technical direction of the evaluation and coordination of technical requirements from other agencies were the responsibility of the Naval Research Laboratory. The evaluation program consisted of the following: (1) Radiation pattern measurements, both airborne and ground based, (2) Impedance measurements on several feeds of the lens, (3) Isolation measurements between feeds on the lens, (4) Line loss measurements between receiver station and lens feeds, (5) Long-term signal/noise and error count measurements. (a-1, b-3, c-1, d-1, e-0, f-Description)

5033. RHODES, D. R., "On a Fundamental Principle in the Theory of Planar Antennas," Proc. IEEE, vol 52, no. 9, pp. 1013-1021; September 1964. ABSTRACT: A general principle is presented which states that all of the properties of any planar antenna can be determined completely from any piece of its TE and TM partial pattern functions. The principle is based on the analytic properties of the pattern functions and on the fact that the aperture and pattern functions are related through the Fourier integral. It applies to much of antenna theory, transient as well as steady state. An interesting application is an analytic extension of the classical Poynting vector method as a means for determining input reactance, in addition to radiation resistance, of an antenna from its radiation pattern. (a-1, b-1, c-1, d-1, e-752, f-Important to theory of antenna impedance computation)

5034. SCHAFFER, A. M., "A Rapid Response Diode Swtich for Low Level Signals in the H.F. Band," University of Illinois, Electrical Engineering Research Laboratory, Urbana, Illinois, Technical Report No. 24, Contract Nonr-1834(02), RRL No. 260; September 1964. ABSTRACT: Design requirements are outlined for a diode switch featuring low insertion loss and high isolation in the range 2-32 Mc/sec. Circuit models are presented using diodes in series, shunt, and series-shunt switching configurations. On the basis of the characteristics predicted for the models, a switch configuration is considered which could be expected to fulfill the design requirements. The measurement apparatus and technique are described and experimental results examined. Differences between measured and calculated switch characteristics are discussed and methods for improving its performance are suggested. The switch performance is superior to those which have been available previously. (a-1, b-3, c-1, d-1, e-971, f-Description)

5035. SHOVER, D. R., "The Relative Motions of Two Independent Communication Satellites," Systems Engineering Group, Research and Technology Division, Wright-Patterson Air Force Base, Ohio, Project No. 4335, ASTIA No. AD-608 809; September 1964. ABSTRACT: This report presents a method of determining the relative positions of two independent communication satellites and the times during which these two satellites are in the proper positions for two specified modes of communication. The method developed is to be used in support of two separate satellite experiments to determine if communication is possible between two satellites, which are physically out-of-line-of-sight of each other, via bending and reflecting radio waves in and through the ionosphere. Presented is a mathematical model that determines the positions of two independent satellites as a function of time in the earth coordinate system in terms of co-latitude, longitude, and altitude. Both satellites are tracked from their injection points throughout their orbits in finite-time increments for a preselected time. In conjunction with determining the positions of the satellites, the model also determines the time, with respect to some given time reference, when the satellites enter and leave the line-of-sight of any set of designated geographical positions as well as when the satellites enter and leave the line-of-sight of each other. The recorded times are summed, and the percentages of the recorded times, based on the total time considered, are determined. (a-1, b-3, c-1, d-1, e-0, f-Method analysis)

5036. ROSS, G., AND SCHWARTZMAN, L., "Continuous Beam Steering and Null Tracking with a Fixed Multiple-Beam Antenna Array System," Trans. IEEE, vol. AP-12, no. 5, p. 541; September 1964. ABSTRACT: Describes how continuous null tracking of a target may be achieved with a fixed pattern multiple-beam forming network with a resulting improvement in tracking accuracy when compared to beam interpolation techniques. Continuous null tracking is accomplished by cascading a hybrid phasing matrix with a beam combining network, called a steering box. The steering box combines three elementary beams in the proper ratio to form a composite sum-and-difference beam which may be continuously steered throughout the coverage angle. The change in the sum-and-difference patterns as a function of steering angle is derived for different steering loci. It is shown how pattern asymmetry may be minimized or sidelobe fall-off rate maximized by the proper choice of a steering locus. Several physical realizations of steering boxes are discussed including the steering box employed in an experimental electronic scanning radar system. (a-1, b-1, c-1, d-1, e-0, f-Description)

5037. WAIT, J. R., AND SPIES, K. P., "Propagation of Radio Waves Past a Coastline with a Gradual Change of Surface Impedance," Trans. IEEE, vol. AP-12, no. 5, p. 570; September 1964. ABSTRACT: The amplitude and phase of a radio ground wave are calculated for an oblique crossing of a flat-lying coast line. The surface impedance is allowed to change in a continuous and gradual manner in the vincinity of the coast line. Earlier results for an abrupt boundary are recovered as the width of the transition zone is reduced to zero. In general, it is found that the presence of the transition region will not produce a significant modification of the transmitted field. On the other hand, the reflected waves and the behavior of the field near the coast line are profoundly influenced by the width of the transition. In particular, certain singular behaviour of the field associated with an abrupt boundary is virtually eliminated when the transition zone has a finite width. (a-1, b-1, c-1, d-1, e-0, f-Theory and analysis)

5038. TRAVERS, D. N., "High Frequency Direction Finding Research for Shipboard Use, Direction Finder Radio, Shipboard Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Contract NObsr-89167, Interim Report No. 1, ASTIA No. AD-447 752; 15 September 1964. ABSTRACT: Repair work to the AN/SLR-10 D/F antenna was performed in preparation for shipboard tests. The repairs are described and recommendations for changes are made. Modifications to the automatic calibrator equipment were completed to simplify observed bearing input for twin channel type crt displays. A procedure for obtaining quick estimates of pattern

quality for crossed antennas, particularly the crossed spaced loop, is outlined and its limitations stated. Progress on the design of a crossed spaced loop (eight-loop array) for shipboard test was continued with a major change in the engineering design. Previous designs using a 10-ft diameter array were abandoned as being too large for shipboard convenience or too expensive to design and fabricate mechanically. The antenna now being investigated uses eight loops in a 5-ft diameter circle and will obtain useful sensitivity in the 2 to 8 Mcs range by varactor tuned circuits at the antenna crossover connections. (a-1, b-3, c-1, d-1, e-1000, f-Progress report. See Abstract No. 4997)

5039. CORWIN, J., AND PIGEON, R., "Search and Analysis, ELINT Electromagnetic Search, Intercept and Analysis Assembly AN/TLQ-22," American Electronic Laboratories, Inc., Colmar, Pennsylvania, Report No. 1, Contract No. DA 28-043-AMC-00242(E), ASTIA No. AD-357 302; 30 September 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-0)

5040. ANONYMOUS, "Long-Distance VHF Communications Ground Antenna Array (Single Bay)," Page Communications Engineers, Inc., Washington, D.C., Interim Report No. 2, Contract FA64WA-5177, ASTIA No. AD-467 270; 30 September 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Description. See also ASTIA No. AD-467 269)

5041. MARTIN, P. E., TRAVERS, D. N., CASTLES, M. P., AND LORENZ, R., "An Experimental Beverage Antenna Array for Land Based Direction Finding between 1.5 and 30 Mc," Southwest Research Institute, San Antonio, Texas, Final Report No. 4, Contract No. DA 36-039-AMC-02346(E), ASTIA No. AD-354 650; 30 September 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-1000, f-0)

5042. ANONYMOUS, "Operational Test and Evaluation Visual and Electronic Aids for Identification of LZ's, DZ's and EZ's," Tactical Air Command, Langley AFB, Virginia, Report No. TR64-34, ASTIA No. AD-450 029; October 1964. ABSTRACT: A concentrated evaluation by an experienced C-130 troop carrier aircrew was made under as near operational conditions as possible to determine which equipment available for use by combat control teams would be of the most value in directing troop carrier aircrews to drop, landing and extraction zones. It was concluded that the following equipment available and of value in guidance of aircrews to the axis of DZ/LZ/EZ's is as listed in order of their importance: (a) radar transponder beacons, (b) high-intensity flares, (c) low-frequency homing beacons, and (d) UHF-D/F. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

5043. BLUE, J. E., "Determination of Transponder Bearing from a Pulsed Sinusoid in a Multipath Transmission Background," Navy Mine Defense Laboratory, Panama City, Florida, Report No. 165, Project No. SF011-02-35, ASTIA No. AD-354 241; October 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-0)

5044. CHASTAIN, J. B., HOLLIS, J. S., HUTCHINS, S. F., AND PIDGEIO, R. E., JR., "Precision Antenna Pattern Recording Techniques, Phase II," Scientific-Atlanta, Inc., Atlanta, Georgia, Project No. 4506, Contract No. AF 30(602)3425, ASTIA No. AD-608 475; October 1964. ABSTRACT: This work is a continuation of work on a study and an investigation made to prove the feasibility of precision amplitude - and angle - measuring devices, combined with sophisticated recording and display techniques, for antenna pattern measurements. The current program includes development of a stabilized transmitter, a precision, high data rate receiver and associated equipment. See also AD-415 912. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

5045. CORWIN, J., RESNICK, A., CECIL, J., AND HVAZD, A. M., "Direction Finder Group AN/TLA-9(XE-2)," American Electronics Laboratories, Inc., Colmar, Pennsylvania, Final Report, Contract No. DA 36-039-AMC-03322(E), ASTIA No. AD-454 632; October 1964. ABSTRACT: Direction finder group AN/TLA-9(XE-2), as finally fabricated, provides a highly effective search and intercept antenna group which, with appropriate receivers, is capable of determining the frequency, polarization, and direction of arrival of all radiated signals in the electromagnetic spectrum from 0.05 to 12.4 gc under the most severe service environment. The direction finder group is composed of the following components: (1) antenna assembly A, (2) antenna assembly B, (3) control indicator, (4) power supply, and (5) RF switch boxes. (a-1, b-3, c-1, d-1, e-0, f-Project summary report)

5046. GEISE, D. T., "A Method of DF Error Correction," IEEE Trans., vol. EMC-6, no. 3, pp. 38-41; October 1964. ABSTRACT: The problem of search with instruments having systematic error is examined and found to be a function of the logarithmic spiral. The case of rectangular constrictions of the search pattern is explored. Extremely simple methods of computing the sought location are disclosed. Description is in terms of locating a transmitting source. Some specific examples are analyzed including the case of a transmitter hidden in a region of downtown streets. The case where the D/F moved in on the target under the restriction of 90° turns only is considered in some detail. The paper does not analyze error sources such as reradiation and apparently assumes that the transmission duration is long enough to establish the search pattern. (a-1 and 4, b-1, c-1, d-1, e-810, f-See Abstract No. 5147 for correction to this article)

5047. KATZENELLENBAUM, B. Z., "A Problem of Wave Propagation between the Earth and the Ionosphere," Radiotekhnika i Elektronika, vol. 9, no. 10, p. 1857; October 1964. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-Theory)

5048. LYNCH, W. M., PRIEDIGKEIT, J. H., MACE, J. C., KEENAN, M. G., AND GLASER, M. B., "Airborne Position-Location Techniques Study," Stanford Research Institute, Menlo Park, California, Semi Annual Report No. 3, Contract DA 36-039-AMC-03393(E), ASTIA No. AD-361 446; October 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 4920)

5049. SANDERSON, G. C., AND SANDERSON, B. C., "Radio-Tracking Rats in Malaya - A Preliminary Study," J. Wildl. Mgmt., vol. 28, no. 4, p. 752; October 1964. ABSTRACT: Miniature, transistorized radio transmitters were successfully adapted for use on rats (Rattus spp.) in Malaya. Radio-tracked rats weighed from 106 to 365 grams each and the transmitters used weighed from 16 to 32 grams each. Ground-to-ground range of the transmitters varied from 50 to about 350 yards. During a 3-month period, nine wild rats were radio-tracked for periods of 1-16 days. The species (R. mülleri, R. sabanus, and R. jalorensis) were radio-tracked successfully. With some exceptions the rats returned to the same dens day after day. They were reluctant to expose themselves; when dens were in heavy ground cover, rats sometimes emerged from them during daylight but remained under cover until darkness. In the absence of heavy ground cover, they emerged just after the onset of darkness, and when the moon was bright they seldom crossed open areas. There was overlapping of home ranges of many rats, of the same and of different species. Leptospirosis-positive and leptospirosis-negative rats had overlapping home ranges. We radio-tracked two leptospirosis-positive R. mülleri but could not isolate leptospires from soil samples collected in and near their dens. The standard diameters of home ranges, as determined by radio-tracking, were consistently smaller than the standard diameters found in the same general area by an earlier worker using livetrapping data. (a-1, b-3, c-1, d-1, e-0, f-Biotelemetry)

5050. SWAIN, G. R., "Antennas in or at the Surface of a Conducting Medium at VLF," New Mexico University, Albuquerque, New Mexico, Report No. EE116, Project No. RF006-01, Contract No. Nonr-279801-FBM, ASTIA Nos. AD-456 625 and AD-453 417; October 1964. ABSTRACT: In order to characterize the behavior of subsurface antennas, the concepts of effective length, effective area, and gain are extended for use with antennas in or near a lossy medium. The interrelations between the antenna merit factors are found to be dependent upon the medium configuration and the antenna positions. Driving-point impedance and radiating properties are investigated for parallel-plate and magnetic toroid antennas which are situated in a highly conducting medium. Because the calibration of the parallel-plate antenna is easily determined, it may be suitable for use as a reference to calibrate other antennas which sense the electric field in a conducting medium. The effective length for the tuned toroid antenna is found to be independent of the characteristics of the highly conducting medium, and hence the toroid may be used as a probe for measuring the electric field in such a medium. Limitations on the performance of a toroidal antenna at the surface of a conducting medium are formulated. (a-1, b-3, c-1, d-1, e-0, f-Experimental results)

5051. WILLIAMS, C., "Improved Transportable H.F. Direction Finder Set," Servo Corporation of America, Hicksville, New York, Third Quarterly Report, Contract No. DA 36-039-AMC-03706(E); October 1964. ABSTRACT: This report covers the work completed by Servo Corporation of America during the third quarter, on the design and development of an Improved Transportable HF Direction Finder. The specific tasks discussed are as follows: (1) The rf and dc control circuits of the fiberglass antenna were modified to improve

the performance in the elimination of cross modulation and improved electrical height selection. (2) Final design and instrumental accuracy data on the azimuth indicator is presented. (3) Fabrication of the new Goniometer commutator chassis was completed and is described. (4) The antenna sequential switch was completed during this period and is discussed. (5) Further results in the investigation of commutator blending law improvements are presented and discussed. (6) The entire system is now entering field testing. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 4994)

5052. BEUKERS, J. M., "Improved Doppler Direction Finding Techniques," Beukers Laboratories, Inc., Stony Brook, New York, Report No. 13, Project No. 5A-6-79191D908-0206, Contract No. DA 36-039-AMC-03401(E), ASTIA No. AD-455 775; 1 October 1964. ABSTRACT: Not available. (a-1, b-3, c-1, d-1, e-0, f-Description)

5053. SEELEY, E. W., "VLF Superdirective Array Wideband Components," Naval Ordnance Laboratory, Corona, California, ASTIA No. AD-607 663; 15 October 1964. ABSTRACT: If improperly designed, the loops, preamplifiers, mixers, and transmission lines tend to deteriorate the directivity of VLF superdirective arrays in which they are used. This report describes the characteristics required of these components when used experimentally in superdirective arrays. Reception patterns of these arrays and illustrations of the respective capabilities of the components are given. (a-1, b-3, c-1, d-1, e-0, f-Discussion and analysis)

5054. SEELEY, E. W., AND KAMP, V. D., "Reception Patterns of VLF Wave Antennas at Optimum Lengths," Naval Ordnance Laboratory, Corona, California, NOLC Report 610, ASTIA No. AD-609 292; 15 October 1964. ABSTRACT: The report presents an analytical study of the horizontal pattern characteristics of the wave antenna at the first, second, and third optimum lengths. The reception patterns depend entirely upon the antenna loss and the wave velocity along the antenna. Curves are presented to show the heights and depths of the side lobes and nulls in the antenna patterns. These curves may be used to design wave antennas with prescribed side lobes and beamwidths. (a-1, b-3, c-1, d-1, e-0, f-Analytical study)

5055. MARTIN, P. E., AND TRAVERS, D. N., "Circular Arrays of Beverage Antennas for High Frequency Direction Finding," Southwest Research Institute, San Antonio, Texas, Project No. SF0010805, Contract No. NObsr-89345, ASTIA No. AD-451 001; 30 October 1964. ABSTRACT: It is the purpose of this research contract to develop an experimental land based wide aperture HF radio direction finding system. Efforts were devoted to modification of the Beverage antenna array by shortening the 180 elements to a length of 27 meters, modification of the mathematical model of the Beverage system to include sampling of the elements at the outer terminals and design and construction of a new solid state RF commutator with 360 inputs. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5056. ANONYMOUS, "Long-Distance VHF Communications Ground Antenna Array (Single Bay)," Page Communications Engineers, Inc., Washington, D.C., Interim Report No. 3, Contract FA64WA-5177, ASTIA No. AD-467 271; 31 October 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 5040)

5057. BRADLEY, P. A., AND HORNER, F., "The Spectra of Lightning Discharges at Very Low Frequencies," J. atmos. terrest. Phys., vol. 11, pp. 1069-1073; November 1964. ABSTRACT: An examination of several recent papers dealing with amplitude and phase spectra of atmospherics shows that the problems involved have not always been correctly formulated. One difficulty in the measurement of phase spectra is the selection of the precise time to which waveforms of atmospherics should be referred. Spectra of radiation fields near idealised forms of lightning discharge have been re-calculated and differences between the results and those previously published are discussed. (a-1, b-3, c-1, d-5, e-0, f-Theory)

5058. GABLER, H., AND WACHTLER, W., "A Method for Sky Wave Error-Free Direction Finding in the Presence of Ground and Sky Waves," Archiv der Elektrischen Uebertragung, vol. 18, no. 10, pp. 657-662; November 1964. ABSTRACT: Describes a directional aerial system and a visual-display direction finder based on the double-channel principle. This arrangement yields error-free direction finding of the ground waves in the presence of sky waves, under anomalous polarization conditions and for different elevation angles. The elevation angle of the sky wave and, hence, the directional sense of the incident waves is also obtained. The usefulness of the method is demonstrated by a number of displays obtained at different transmitting stations. (a-3, b-1, c-4, d-4, e-0, f-Description)

5059. GALBIATI, L. J., "Proceedings of the Tropospheric Refraction Effects Meeting (No. 3). Volume I. Results and Status of Tropospheric-Effects Measurement Program," Mitre Corporation, Bedford, Massachusetts, Project No. 705-1, Contract No. AF 19(628)2390, ASTIA No. AD-609 731; November 1964. ABSTRACT: This publication covers the presentations made at the Third Tropospheric Refraction Effects Meeting, sponsored by the Electronic Systems Division of the Air Force Systems Command. The proceedings are being published in two volumes for ease in handling; the papers covering the work on tropospheric refraction sponsored by the Electronic Systems Division in support of metric instrumentation on the national missile ranges, are contained in Volume I. While these papers are complete in themselves, many of the specific details on the work covered in the proceedings of the second Refraction meeting (ESD-TDR-64-103) have not been repeated. The first volume also contains papers on the Findings and Recommendations of the National Academy of Science 'Panel on Tracking Data Analysis' in the Area of Tropospheric Propagation and Refraction, Refractometer and Humidiometer Development of the Naval Research Laboratory, Spaced Refractometer Program of Eastern Test Range, and Canadian Tropospheric Measurement Activities. Presentations on certain refraction activities at the Pacific Missile Range, the National Bureau of Standards, Ft. Huachuca, Ballistic Research Laboratory, MIT Round Hill, Cold Lake Canada, on new measurement techniques, and on Tropospheric and Ionospheric Effects on Interferometer Systems have been included in Volume II. (a-3, b-3, c-1, d-1, e-0, f-Symposium report)

5060. HORNER, F., AND BRADLEY, P. A., "The Spectra of Atmospherics from Near Lightning Discharges," J. atmos. terrest. Phys., vol. 26, no. 11, pp. 1155-1166; November 1964. ABSTRACT: Atmospherics from several storms have been recorded simultaneously at a number of frequencies from 6 kc/s to 450 Mc/s and the amplitudes and total energies determined as a function of frequency. The amplitude spectrum deduced from all the data shows an inverse linear relationship with frequency from about 10 kc/s upwards. The range of amplitudes from one storm and the differences between one storm and another have been examined. (a-1, b-1, c-1, d-5, e-0, f-Experimental results)

5061. HUGGETT, W. K., GRONQUIST, R. J., DAVIS, C. A., AND HENRY, E. E., "Optical Processing of Antenna Arrays for Simultaneously Resolving Many Signals in Both Bearing and Frequency," University of Michigan, Institute of Science and Technology, Ann Arbor, Michigan, Report No. 6400-9T, Contract No. DA 28-043-AMC-00013(E), ASTIA No. AD-451 661; November 1964. ABSTRACT: This report presents the results of a theoretical and experimental investigation of optical processing of signals received by an antenna array. The Fourier transform properties of coherent optical systems have a natural application to antenna beam-forming. A continuous, multiple-beamed, phased array can be processed, optically, in such a fashion that many rf signals can be simultaneously resolved in both frequency and bearing. Experimental verification of the theory is also presented. The experimental breadboard utilizes an ultrasonic delay-line array to produce a real-time, sonic-wave analog of the electromagnetic waves received by the antenna array. (a-1, b-3, c-1, d-1, e-0, f-Theory and experimental analysis)

5062. KEISER, B. E., "The Wave Tilt of an Electromagnetic Wave Propagating in the Earth-Ionosphere Cavity," Trans. IEEE, vol. AP-12, no. 6, p. 793; November 1964. ABSTRACT: A solution is obtained for the electric field of the dominant mode propagated in a parallel plane waveguide formed by the earth's surface and a sharply bounded ionosphere. With typical values of the conductivities inserted into these results, the horizontal component of the electric field is shown to vanish at only 120 ft over sea water and at about 7,500 ft above earth of conductivity 10^{-3} mho/metre. This fact together with the possibility of higher order modes and the non-sharpness of the ionosphere boundary, would make conductivity measurements by this technique difficult to assess. (a-3, b-1, c-1, d-1, e-0, f-Theory)

5063. MORGAN, A. H., AND BALTZER, O. J., "A VLF Timing Experiment," J. Res. Nat. Bur. Stand., vol. 68D, no. 11, p. 1219; November 1964. ABSTRACT: The purpose of the experiment given in this paper was to measure the differential phase stability of two VLF carriers (19.9 kc/s and 20.0 kc/s) as received at Austin, Tex., as a function of the observing time, using the former low power standard frequency broadcasts of WWVL, Sunset, Colo. These measurements indicate that, at the distance involved (1400 km) and with n averaging

time of a few hours, the envelope or group delay variations will cause a "jitter" in the received envelope zeros at the receiver of less than one cycle at 20.0 kc/s. Therefore, a particular cycle of the 20.0 kc/s carrier as transmitted may be identified at the receiver, thus providing "microsecond" timing. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

5064. ROGERSON, J. E., AND RHOADS, F. J., "VLF Wave Propagation (Antipodal Effects in VLF Wave Propagation)," NRL,"Report of NRL Progress," See Department of Commerce PB181568, pp. 42-43; November 1964. ABSTRACT: The U.S. Naval Research Laboratory is conducting a comprehensive investigation of very-low-frequency (vlf) radio wave propagation. The objective of this investigation is to determine the parameters necessary for predicting the reliability vlf communications in the ocean areas throughout the world. It is believed that an investigation of the fields at and near the antipode of a vlf transmitter would provide much propagation information. (a-1, b-3, c-1, d-1, e-0, f-Study report)

5065. SMITH, J. S., AND OWEN, D., "Flight Test Report of the DML-4 Direction Finding Set," Systems Engineering Group, Research and Technology Division, Wright-Patterson Air Force Base, Ohio, Report No. TR64-65, Project No. 119P, ASTIA No. AD-355 363; November 1964. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5066. AMES, J., "Spatial Properties of the Amplitude Fading of Continuous HF Radio Waves," J. Res. Nat. Bur. Stand., vol. 68D, no. 12, p. 1039, December 1964. ABSTRACT: Amplitude fading of 17 Mc/s CW signals is observed on 12 dipole antennas evenly spaced in two perpendicular rows each about 300 m long. The signals are ionospherically propagated over approximately east-west 20 to 35 deg N latitude paths of 1840, 3741, and 5724km. The number of hops on the two shorter paths is determined by oblique, step-frequency soundings. Periodic spatial fading patterns consisting of approximately straight, parallel nulls exist 33 percent of the time on the 1840 km signal and 10 percent of the time on the 5740 km signal. Mean null spacing on the 3741 km signal varies from 1.4 km during periods of 1-F propagation to 0.4 km during periods of 3-F propagation. The periodic fading patterns are shown to be caused by multipath interference between rays. A tendency for the nulls to have a diagonal position, with respect to the great circle connecting the transmitter and receiver, is found to be a result of small azimuthal ray deviations caused by small transverse ionospheric tilts. During two magnetic storms the lateral ionospheric tilt over the 3741-km path appeared, from the fading pattern measurements, to be less than normal during the first 10 hr, and somewhat greater than normal during the remainder. During one of these storms the fading patterns were much more periodic than usual, implying that the random variations in ionization density were smaller than usual. These results show that measurement of the direction of fading patterns on the ground is a sensitive technique for studying small ionospheric tilts. In addition, it appears that dual space-diversity reception, over paths where lateral ionospheric tilts of one predominant direction are encountered, can be optimized by spacing antennas along a line normal to the predominant null direction. (a-1, b-1, c-1, d-1, e-0, f-Experimental results)

5067. BITTERLICH, W., "On the Propagation of VLF Waves in Solids," Innsbruck University, Innsbruck, Austria, Contract No. AF 61(052)490, ASTIA No. AD-613 593; December 1964. ABSTRACT: In the report, different measuring devices, transmitting and receiving antennas (direction-finder antennas) for the VLF region are discussed. The measurements of propagation in inhomogeneous rock are mainly concentrated to the determination of the direction of the field vector at the point of reception. The problem near field - far field of the electrical parameters of rock, comprehensive measurements were conducted in solid rock and in rock samples, furthermore the frequency dependence of sigma and epsilon was studied. The influence of the gallery configuration on the result of a sigma-measurement was studied in detail. The theoretical part mainly deals with the problems of excitation of a VLF wave in rock, giving a detailed comparison between electrical and magnetic dipoles. (a-1, b-3, c-8, d-16, e-0, f-Theory and discussion)

5068. BOWERS, R. A., "Atmospheric Refraction Effects In Space Vehicle Tracking," Bull. Seismol. Soc. Amer., vol. 54, no. 6, pp. 2185-2197; December 1964. ABSTRACT: The mathematics of earthquake seismology are used to derive new analytic expressions for the effects of atmospheric refraction on the measurements of conventional radio frequency tracking devices. These expressions are concise, accurate, and rapidly evaluated in single precision. Expressions are also derived for the effects of refraction on time derivatives of the measurements. (a-3, b-1, c-1, d-1, e-0, f-Theory)

5069. HALL, R. B., "The Formation of the Sparadic-E Layer," J. atmos. terrest. Phys., vol. 26, no. 12, pp. 1143-1146; December 1964. ABSTRACT: It is assumed that sporadic-E is caused by the vertical movement of ionization to form a layer of enhanced ionization, the limiting width of such a layer being determined by the effects of diffusion. Thus since the diffusion constant varies markedly with geomagnetic latitude it is predicted that layer formation will be more likely near to the geomagnetic equator and that the layer thickness will vary as sin I, where I is the angle of magnetic dip. (a-3, b-1, c-1, d-5, e-0, f-Propagation study)

5070. MARTIN, P. E., AND TRAVERS, D. N., "Circular Arrays of Beverage Antennas for High Frequency Direction Finding, Interim Development Report for a Study Technique to Produce a High Frequency Land-Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, San Antonio, Texas, Contract No. NObsr-89345; 31 December 1964. ABSTRACT: The major effort during the past quarter has been devoted to the construction of the 360 input solid state commutator. The first of twelve identical 30 input modules is nearly complete with the remaining eleven expected to be completed during the next quarter. Power Dividers, High pass filters and phase matched lead-in cables have been installed at the antenna site. Testing of the Circular array of 27 meter long elements spaced every 2 degrees in azimuth will begin shortly. Array patterns calculated from the modified computer program (modified to allow array calculations for feed points at the periphery of the array) have been plotted and show very little change from patterns calculated, using the same number and spacing of elements, for feed points located at the inner array radius. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5071. TRAVERS, D. N., "High Frequency Direction Finding Research for Shipboard Use: Direction Finder Radio, Shipboard Siting and Design, Study and Development," Southwest Research Institute, San Antonio, Texas, Contract No. NObsr-89167, ASTIA No. AD-610 000; 31 December 1964. ABSTRACT: Completion of repairs to the AN/SLR-10 spaced-loop antenna including satisfactory access door gaskets is reported. Initial tests on the AN/SLR-11 particularly the antennas and preamplifiers were performed. Equipment developed a number of years ago for azimuth curve plotting was extensively modified in order to replace an obsolete X-Y recorder and to reduce the size and weight of the equipment. The final experimental work toward the selection of a crossed spaced loop direction finding geometry is under way. Mechanical design of the model to be shipboard tested was started. Electronic tuning will be used in the upper frequency range from 2 to 6 mcs, and a self-calibration feature will be included to insure balance of the tuning circuits. The need for more information on required bearing sensitivity is mentioned. Lacking such information, new calculations are under way to set recommended sensitivity requirements for future designs especially in the lower HF range. (a-1, b-3, c-1, d-1, e-0, f-See Abstract No. 5038)

1965

5072. BERGMAN, C. W., "Propagation Characteristics of Radio Waves in Jungle or Forest," paper presented to URSI Commission 2; 1965. ABSTRACT: The solution of the problem of radio waves propagating in jungle does not exist and because of the complexity of the problem, it may not be possible to solve it exactly. The need to communicate between points in jungle, forest, or terrain otherwise covered with foliage has made it necessary to find an approximate solution. Two models are assumed, both approximations of the jungle by an infinite homogeneous medium. The validity of the models is checked with the result of experiments conducted in the rain forest of New Guinea. (a-5, b-1, c-1, d-1, e-0, f-Theoretical analysis)

5073. BLACKMAN, R. V. B., Jane's Fighting Ships, McGraw-Hill Book Co., Inc., New York, N.Y., 1964-1965 Edition. ABSTRACT: Contains many photographs of naval vessels of various countries, in many cases showing the location of high frequency direction finding antennas. (a-4, b-6, c-1, d-1, e-0, f-67th year of publication. Similar publication available for aircraft)

5074. BURROWS, C. R., "Ultra-Short-Wave Propagation in the Jungle," paper presented at Fall Meeting of U.S. National Committee, URSI, Dartmouth College, Hanover, New Hampshire; 1965. ABSTRACT: The predominant characteristic of propagation in the VHF frequency range is the presence of a reflected wave which tends to cancel the direct wave and results in the received field being proportional to the product of the antenna heights and inversely proportional to the square of the distance; and the radio gain being independent of frequency. For

propagation in the jungle in the meter wavelength range (VHF) between dipole antennas, the radio gain can be expressed

$$\frac{P_r}{P_t} = \left(\frac{3h_1h_2}{2d^2}\right)^2\left(\frac{R_o}{R}\right)^2 F_s^2 F_j^2$$

where R_o is the radiation resistance of the dipole antenna in free space and R is its value as affected by the proximity of the ground and foliage, F_s is the shadow factor that accounts for the curvature of the earth and F_j is the factor that accounts for the effect of the jungle. (a-5, b-1, c-1, d-1, e-0, f-Analytical survey)

5075. KARANDEEV, K. P., AND GRINEVICH, F. B., "On Designing Antennas for Geophysical Research by Natural Electromagnetic-Field Methods," Izv. Acad. Sci. USSR, Phys. Solid Earth, no. 4, pp. 279-281; 1965. ABSTRACT: The parameters which determine the quality of loop and ferrite aerials for receiving random magnetic fields are determined. It is shown that the quality is increased not by using high-permeability cores but by increasing the dimensions of the loops without cores. (a-3, b-2, c-1, d-2, e-0, f-Theory)

5076. FISCHER, W. H., "The Radio Noise Spectrum from ELF-EHF," J. atmos. terrest. Phys., vol. 27, pp. 475-480; 1965. ABSTRACT: Numerous investigators have reported upon radio noise in various narrow regions of the spectrum. Several such reports have been gathered together, converted to a common basis, and reported here. The antenna types and locations are listed. The methods of converting the original data to a common base are given. The radio noise spectrum from 5 c/s (60,000 km) to 1 Gc/s (30 cm) is presented and discussed. (a-1, b-1, c-1, d-5, e-0, f-Survey)

5077. HELLIWELL, R. A., Whistlers and Related Ionospheric Phenomena, Stanford University Press, Stanford, California; 1965. ABSTRACT: This book is the first to summarize the fascinating field of whistlers and very-low-frequency (VLF) emissions. It will not be the last, for the field continues to develop rapidly. But it provides a standard of lucidity and coverage that any successor will find difficult to surpass. After a short introduction and a historical review leading up to the International Geophysical Year, the theory of VLF propagation within and beneath the ionosphere is developed. A clear presentation is included of the complex effects that the magnetically imposed anisotropy of the ionosphere impose on the propagation of VLF energy. The relations between incident, reflected, refracted, and ducted waves are illustrated pictorially in a number of diagrams which, though complicated, have been prepared with care and will reward any reader who follows their interpretation with equal care. The attenuation of VLF signals, both in the absorbing ionosphere and in the Earth-ionosphere waveguide, is developed in a manner designed to illustrate the principles involved, while yielding approximate numerical results for a selection of model cases. Although treated under the title "Theory of Whistlers," the discussion of these propagation processes is, for the most part, equally applicable to VLF emissions. Whistlers themselves come to the fore on page 83. They are illustrated extensively by some thirty pages of dynamic spectrums, often with several spectrums per page, depicting the full gamut of types detected at stations spread widely over the globe (and a few detected in the ionosphere by Vanguard 3). The nature of whistlers is discussed here at length: their sources (natural and artificial), their echoing, and their geographic and temporal distribution, as well as their amplitude, polarization and dispersion characteristics. A separate chapter deals with the exploration of the whistler mode of propagation by means of fixed-frequency radio transmissions, and another chapter describes the extremely valuable contributions that whistler studies have made to our knowledge of magnetospheric electron distributions. VLF emissions are treated in a single chapter, beginning on page 203, which perhaps befits their less certain present status; but they are illustrated by an even more extensive spectral atlas (80 pages). The text in this chapter summarizes the best established characteristics of the various emission types, and outlines the theories that have been proposed for their origins. A brief appendix on the dipole geomagnetic field is followed by an extensive bibliography (21 pages) that goes well beyond the specific references cited in the body of the text, and includes entries through 1964. The index is excellent. The book is by no means exhaustive in its coverage, nor, presumably, was it intended to be. For example, the magneto-ionic formulas are assumed rather than established, although this constitutes no shortcoming in view of other texts now available on the subject. The paucity of detail in the theoretical development of wave ducting is somewhat disappointing, since much of the extensive work in this field was specially designed for application to whistlers. Similarly, the theories of VLF emissions are presented largely in qualitative terms without mathematical development. (a-5, b-6, c-1, d-1, e-0, f-Book review)

5078. MCARTHUR, R. R., AND SLANKARD, M. L., "Correlation of Ship Position Reports Gathered by Simulated Ocean Surveillance Satellites," Naval Postgraduate School, Monterey, California, Masters thesis, ASTIA No. AD-475 298; 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Thesis for Masters degree)

5079. SPANGENBERG, K. L., Electromagnetics in Space, McGraw-Hill Book Co., New York, New York; 1965. ABSTRACT: This book is a collection of topics on space communication system engineering. The authors are members of the Research and Development Division of the Lockheed Missiles and Space Company. The contents of the first four chapters are in the nature of a survey. The last two chapters, which cover half of the book, present a method of analysis of mutual coupling effects in antenna arrays. Every chapter includes an extensive bibliography. Chapter One, by A.S. Dunbar, reviews the fundamentals of electromagnetic theory with emphasis on radiation. The survey is rather brief and could be profitably expanded. Mention of a future Vol. II is made in which ionospheric propagation will be treated. Chapter Two, by T.H. Lee, introduces the reader to the problems of ultra long range, including earth-satellite and interplanetary communication. The topics of available transmitter power, antenna gain, receiver bandwidth and noise are considered with reference to the state-of-the-art. Particular emphasis is given to the noise problem. A discussion of some earth-satellite global communication systems is included. Chapter Three, by J.L. Bellamy, describes the role of ground antenna in a space communication system, in the presence of extra-terrestrially generated noise. Information on the noise level of various extraterrestrial noise sources is presented. Gain limitations of large aperture antennas, due to the size and surface irregularities, are discussed. Chapter Four, by A.S. Dunbar, deals with spacecraft antenna requirements, various factors such as low pressure, radiation and their effects on materials, and finally, mechanical requirements for unfurling a high gain antenna on a space probe. Chapter Five and Six, by E.A. Blasi, deal with mutual impedances of two linear or helical antennas and with impedance perturbation in antenna arrays. The topics are of interest in view of the significance of large arrays for space communication applications. Chapter Six presents a method of calculation of the elemental input impedance in various types of $\lambda/2$ spaced dipole arrays. Basic assumptions are: knowledge of current of each element and of all relevant open circuit impedance parameters which are usually obtained in practice from King's data. Effect of beam scan in phased arrays on the "active" impedance and the variable loading on the feeding transmission line during scan is analyzed. (a-5, b-6, c-1, d-1, e-0, f-Book review)

5080. WAYNICK, A. H., "The Physics of the Ionosphere: Part I - The Lowest Ionosphere," Report of 1954 Cambridge Conference, ASTIA No. AD-626 232; 1965. ABSTRACT: An attempt is made to summarize the recent radio data which may be utilized as a guide to the possible physical characteristics of the lowest ionosphere. The consideration of anomalies and short period phenomena are purposefully avoided in an effort to deduce gross characteristics. The apparent current state of work concerned with four physical characteristics of the lowest ionosphere which are based in part on this evidence, and in part, on available, pertinent rocket data is briefly described. The factors considered are collision frequency, recombination, E-region electron density distribution, and D-region electron density distribution. (a-1, b-1, c-1, d-1, e-0, f-Conference review)

5081. DULLES, A., The Craft of Intelligence, New York: The New American Library, Incorporated, Signet Book No T-2584, pp. 123-126; January 1965. ABSTRACT: Describes in laymen's language, the processes by which radio direction-finding has been used to advantage by intelligence agents and gives a historical review (elementary) of D/Fing by counterintelligence forces from World War II to the present time, citing some particular cases. (a-4, b-6, c-1, d-1, e-0, f-Book)

5082. GETHING, P. J. D., "Relationship between Phase and Effective Path for Oblique Ionospheric Propagation," J. atmos. terrest. Phys., vol. 27, no. 1, p. 57; January 1965. ABSTRACT: The effects of earth curvature were neglected by Appleton in deriving the well-known relationship

$$\frac{dP}{df} = \frac{1}{f}(P' - P)$$

between phase path P and effective path P' for oblique propagation of a signal of frequency f. It is shown that this equation is still rigorously satisfied when earth curvature is taken into account. An expression for phase path, correct to first order curvature terms, is derived for a layer of parabolic electron density distribution and it is shown that the relationship is satisfied by this and the corresponding

expression for effective path. The connection between phase path variations and D/F errors is examined. (a-1, b-1, c-1, d-5, e-0, f-Theory)

5083. HOPFIELD, H. S., "Improvement of the Tropospheric Correction for Doppler Data, Based on a Study of Upper Air Meteorological Data," Johns Hopkins University, Applied Physics Lab., Silver Springs, Maryland, Report No. TR-646, Contract No. NOw-62-0604c, ASTIA No. AD-459 426, January 1965. ABSTRACT: The effect of tropospheric refraction on the Doppler shift has up to now been computed on the basis of a simple quadratic model of the height variation of the refractivity N of air. The validity of this model in predicting the correct tropospheric range error for a vertically arriving signal is investigated here. The area under an N vs. height curve obtained from observed upper air data has been compared with the area under the corresponding quadratic profile (which starts at the same surface value of N), for 34 profiles observed at a variety of geographic locations, altitudes and seasons. The results show that the ratio between the tropospheric error due to the quadratic model and that due to the observed refractivity profile is in general not unity but is a linear function of the refractivity at the surface. This relation provides a simple correction factor for improving the computed tropospheric refraction correction for the Doppler shift. (a-1, b-3, c-1, d-1, e-0, f-Experimental results)

5084. IIZUKA, K., "The Circular Loop Antenna Multiloaded with Positive and Negative Resistors," IEEE Trans. on Ant. and Prop., vol. AP-13, pp. 7-20; January 1965. ABSTRACT: Studies are made of both the driving-point impedance and the amplitude and phase distributions of the current in a circular loop which is driven by an arbitrary number of delta-function generators and loaded with an arbitrary number of lumped impedances. The only restriction imposed in the present treatment is that the elements (either generator or load) are spaced at equal intervals of $2\pi b/m$ along the circumference where m is the total number of elements and b is the radius of the loop. The numerical calculations include loads with negative resistances in order to take account of loops loaded with an element like an Esaki tunnel diode, with proper precautions against both self-oscillation and switching effects. A study of such precautions is to be considered separately. The experimental results agree quite well with theory except for the larger values of βb. The radiation patterns of the loop antennas with $\beta b = 1$ loaded with various resistors were also measured. (a-5, b-1, c-1, d-1, e-0, f-Analysis)

5085. KRAWCZYK, M., "The Analysis of Work of Duplexer for Direction Finding," Rozprawy Elektrotech, vol. 11, no. 1, pp. 211-237; January 1965. ABSTRACT: The duplexer includes two tubes ATR (anti-transmit-receive) and one tube TR (transmit-receive). The accurate analysis concerns the work of the duplexer at low power level. In consequence expressions have been obtained, which determine the optimal distance between both tubes ATR the influence of losses of the tubes ATR and of reflection factor of transmitter on the reflection factor branch of transmitter. The design of this duplexer at low power le- could be based on the discussed equations. (a-3, b-1, c-22, d-22, e-0, f-Analysis)

5086. IIZUKA, K., "The Circular Loop Immersed in a Dissipative Medium," IEEE Trans. on Ant. and Prop., vol. AP-13, pp. 43-47; January 1965. ABSTRACT: Investigations were made of the radiating and circular properties of circular loop antennas when immersed in conducting media with various loss tangents. The following quantities were experimentally examined and compared with the available theoretical results. (1) Driving point admittance Y_{in} of circular loops as a function of the circumference per wavelength, $2\pi b/\lambda = \beta b$. (2) Current amplitude and phase distributions. (3) Field patterns. In each case the loss tangent $\sigma/\omega\epsilon_r\epsilon_0$ of the medium (conductivity σ, permittivity $\epsilon_r\epsilon_0$) is taken as a parameter. The experimental results are in good agreement with the theory. A comparison between the behavior of the loop in a conducting medium and those of a linear dipole was made wherever possible. It was discovered that there is a cut off size beyond which the driving point admittance of a linear dipole is the same whether or not its ends are connected to form a loop. This particular loss tangent is 1.06, and the cut off size is $\lambda/2$. A circular loop antenna with $\beta b = 1.0$ is excited predominantly in a dipole mode and its field pattern resembles that of a two element dipole array. A study was made to determine how this pattern becomes more like that of a monopole as the loss tangent of the solution is increased. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

5087. IIZUKA, K., "Circular Loop Antenna Multiloaded with Positive and Negative Resistors," Trans. IEEE, vol. AP-13, no. 1, pp. 7-20; January 1965. ABSTRACT: Theoretical analysis of both driving-point impedance and amplitude and distribution of current in circular loop antenna which is driven by number of delta function generators, and loaded with arbitrary number of lumped impedances; computation of driving-point impedance amplitude and distribution of electric current using tunnel diode as two-terminal loading element. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

5088. KRAMAR, E., "Doppler Principle as Navigation Aid," Nachrichtentechnische Zeit, vol. 18, no. 1, pp. 27-32; January 1965. ABSTRACT: Brief review of present day practical applications in radio location, two new Doppler navigation methods developed in United States are discussed, of which one employs principle of synthetic directional antennas while other uses laser gyro, called ring laser, for navigational purposes. (a-3, b-2, c-4, d-4, e-0, f-Survey)

5089. LOZINS, N., "Spatial Aiming of Reconnaissance Sensors," Honeywell, Inc., St. Petersburg, Florida, Technical Report AL TR-64-344, Contract AF 33(657)11565, ASTIA No. AD-460 894; January 1965. ABSTRACT: This study concerns the feasibility of pointing and controlling reconnaissance sensors within an accuracy of ten arc-seconds or better. Both aerodynamic and space environments are considered Descriptions and functional block diagrams for both gimbaled and hard-mounted (ungimbaled) reconnaissance systems are developed. In order to establish accurate pointing control feasibility, laboratory demonstration hardware in breadboard form was developed. The command servo system developed under this program achieved ±2.5 arc-second accuracy. The servo loop performance was limited only by the encoder resolution. (a-1, b-3, c-1, d-1, e-0, f-Technical report)

5090. SILBERSTEIN, R., AND DICKSON, F. H., "Great-Circle and Deviated-Path Observations on C.W. Signals Using a Simple Technique," Trans. IEEE, vol. AP-13, no. 1, pp. 52-63; January 1965. ABSTRACT: ABSTRACT: A modification of the Pinwheel techniques of observing hf signals propagated over deviated paths was used over Pacific paths on 12, 18, and 30 Mc/s. Strip-chart records made of cw signals with directive receiving aerials rotating ten times as fast as similar transmitting aerials gave distinct records of deviated scatter signals alone or coexisting with great-circle signals. By the use of precise programme timers, combined receiving and transmitting azimuths for strongest signals were obtained. Although scattering from land masses or from equatorial "spread-echo" layers seemed a possibility when scatter signals came from a relatively fixed location, most of the results examined indicated, for all frequencies, variable scattering locations on the dea, determined by skip conditions. The method, in refined form, appeared to hold promise both as a research tool and as a means of obtaining additional hours of useful propagation during failure of a great-circle mode. It was believed that the techniques should be investigated as a possible alternative or adjunct to the station-network scheme currently considered as a means of routing traffic during arctic disturbances. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

5091. STEINER, W. G., "A Digital Technique for the Measurement of Phase Angle," Illinois University, Engineering Experiment Station, Technical Report No. TR-26, Contract Nonr-183402, ASTIA No. AD-612 146; January 1965. ABSTRACT: A digital technique for the measurement of phase angle is presented. Although the method is completely general, a particular model is designed here. The model is designed to measure in 100 microseconds the phase angle between two 250 kc input signals which range independently between 50 mv and 10 v rms in amplitude. The measurement is indicated electronically by means of sixteen parallel output signals and visually by means of four Nixie indicator lamps. This discussion also includes a statistical analysis of the effect of random noise on accuracy and an evaluation of a portion of the phasemeter which was actually built and tested. (a-1, b-3, c-1, d-1, e-0, f-Description)

5092. STORM, G. L., "Movements and Activities of Foxes as Determined by Radio-Tracking," J. Wildl. Mgmt., vol. 29, no. 1, p. 1; January 1965. ABSTRACT: In Carroll County, Illinois, the movements of five red foxes (Vulpes fulva) fitted with miniature collar-type transmitters were recorded by using a tracking system described by Cochran and Lord (1963). Four recaptured foxes, two of which had carried transmitters during a 10-month period, showed no evidence of skin chafing caused by transmitters. Adult animals regularly returned to familiar rest areas for daytime resting but seldom reused a particular bedding place. Two adult males were located at night an average distance of about 0.5 mile from daytime rest areas. These estimates are based on the distances between radio fixes representing daytime retreats and individual fixes showing nocturnal movements. The home range of one adult male during a 6.5-month period was 1.9 miles long by 1.4 miles wide. Precise estimates of home-range areas seemed infeasible, but crude acreage estimates for the ranges of two adult foxes averaged 955 acres. Intraspecific activity and availability of food were markedly important environmental factors affecting the movements of foxes. (a-1, b-3, c-1, d-1, e-0, f-Biotelemetry)

5093. WEIL, H., AND WALSH, D., "Radiation Resistance of Elementary Loop Antenna in Magnetoionic Medium," Trans. IEEE, vol. AP-13, no. 1, pp. 21-27; January 1965. ABSTRACT: Formulas for radiation resistance for loop antenna immersed in magnetoionic plasma; computation of radiation resistance using digital computers; analytic expression is derived for case of small magnetic fields. (a-3, b-1, c-1, d-1, e-0, f-Theory and analysis)

5094. ZABOKLICKE, E., "A Method for Designing Inductive Loops for Personal Paging Equipment," Prace Inst. Tele-i Radiotech., vol. 9, no. 1(30), pp. 63-84; January 1965. ABSTRACT: The distribution of magnetic field produced by inductive loops in buildings with reinforced concrete and steel construction was investigated. Experiments were performed over the ultrasonic frequency range, as used in the Personal Paging Equipment. Results are compared with those calculated for free-space conditions, and a coefficient β_{min} is derived which takes into account the effect of steel structures upon the magnetic field distribution. A method for designing inductance loops for personal paging installations is given, based on the experimental correction coefficient, β_{min}. (a-3, b-1, c-22, d-22, e-0, f-Experimental results)

5095. ANONYMOUS, "Direction Finding Techniques in VHF-UHF," Goodyear Aerospace Corp., Litchfield Park, Arizona, Interim Engineering Report No. 2, Contract AF 33(615)1942, ASTIA No. AD-356 267; 1 January 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5096. SHERRILL, W. M., "Polarization of Jovian Emission at Decametre Wavelengths," Nature, vol. 205, p. 270; 16 January 1965. ABSTRACT: During the period September 1-December 31, 1963, observations of the polarization of radio-wave emission from Jupiter were made at 15.2, 16.2, 18.2, 22.2, and 24.2 Mc/s. The Southwest Research Institute two-helix polarimeter, utilizing a twin channel receiver, was expanded so that determination of the cross-correlation of the right and left circular components was made separately for each Jupiter burst. This type of radio polarimeter scheme has been described by Cohen. The calibrated polarimeter thus provided determination of the polarization fraction (m), axial ratio (r) and sense of the Jupiter bursts observed. (a-1, b-2, c-1, d-5, e-1000, f-Experimental results)

5097. ANONYMOUS, "Broadband Spurious-Radiation Detection, Symetrics Engineering Model 302A," Symetrics Engineering Corp. of Florida, Satellite Beach, Florida, Instruction Manual, Contract No. AF 08(606)6531, ASTIA No. AD-463 458; 21 January 1965. ABSTRACT: This handbook contains instructions for the Model 302A Spurious-Radiation Detector. The Model 302A is a combination of commercially available test equipment and designed components integrated into a single unit. In view of the distinct characteristics of the subunits of the Model 302A, this instruction manual has been written with the intent of explaining each subunit individually in Section II with integration criteria and operating instructions provided in the remaining sections. The Model 302A Spurious-Radiation Detector is a very sensitive instrument for detecting low level RF signals in the 30 mc to 8.3 Gc frequency range. The Model 302A was designed as a portable unit. The Model 302A utilizes a series of in-line couplers and hand-held probes for detecting known or unknown signals inside waveguide (RG-51 waveguide only) or external to any RF system. The Spurious-Radiation Detector consists of a Broadband Spectrum Analyzer, Oscillator Synchronizer, Traveling Wave Tube Preamplifiers, Frequency Meters, 1 mc Marker Generator, and assorted probes and in-line couplers. (a-1, b-3, c-1, d-1, e-0, f-Description)

5098. EITZENBERGER, J., FISCHER, W., HARBAUER, J. K., HILLMANN, J., AND RIES, G., "Research in Connection with Propagation of Very Low Frequencies," Battelle Institute Frankfurt am Main, Final Technical Report, Contract No. DA 91-591-EUC-1873, ASTIA No. AD-460 780; 31 January 1965. ABSTRACT: The receiving equipment used in the initial stage of research had a partly mechanically operated servo loop. Our studies led to the development of a receiving device with an electronic filter of extremely small bandwidth. The bandwidth and thus the response time of recording can be easily accommodated to the signal-to-noise ratio. An extensive noise suppression is reached by various circuit arrangements. The results furnished by the analysis of the phase and amplitude recordings for large distances (d > 5000 km) between transmitter and receiver confirmed the model of one-mode propagation. However, for explaining details, especially during sunrise and sunset, the higher-order modes have to be taken into consideration. At smaller distances (720 km) between transmitter and receiver the interference between the ground wave and the different sky waves leads to irregular phase and amplitude variations for the resultant field strength. (a-1, b-3, c-8, d-4, e-0, f-Experimental results)

5099. MOORE, J. D., AND TRAVERS, D. N., "Portable Spaced-Loop Antenna," Southwest Research Institute, San Antonio, Texas, Final Progress Report No. 4, Contract No. DA 36-039-AMC-03405(E), ASTIA No. AD-464 501; 31 January 1965. ABSTRACT: The theory of the portable coaxial spaced-loop antenna is reviewed by reference to early reports detailing the theoretical performance. The experimental model of the portable spaced-loop antenna covering the 20- to 150-mc frequency range is described in detail. The testing of the experimental antenna incorporating the modified AN/PRD-7 and 8 pedestal and the azimuth indicator for the AN/PRD-5 at Southwest Research Institute is described. The results of the sensitivity tests indicate that the antenna is capable of taking bearings on 2 microvolt per meter signals over the required range. The D/F and sense performance of the antenna is described for vertical polarization, horizontal polarization, and mixed polarization. Bearing error data are given in terms of each polarization. All observed pattern distortions and bearing errors are listed and traced to specific engineering limitations of the first model. These limitations of the first model are engineering and may be corrected by improved design. Design improvements of the experimental model are discussed in detail. The use of three separate antennas for the same pedestal to cover the 20- to 150-mc frequency range is suggested as the most practical method of over-coming control circuitry complications of the single antenna and to avoid other problems of the single antenna approach. It is concluded that it is feasible to use a coaxial spaced-loop as a portable direction finder in the 20- to 150-mc frequency range with a 2-microvolt per meter sensitivity. The limitations which exist in the present model are not fundamental in nature but are related to engineering design procedure; furthermore these limitations are all in the area of pattern distortion and not sensitivity. (a-1, b-3, c-1, d-1, e-1000, f-Summary)

5100. ANONYMOUS, "Spectrum Signature Data of Rawin Set AN/GMD-1B, Serial No. 292," Pan American World Airways, Inc., Tucson, Arizona, Contract No. DA 02-086-AMC-0032(R), Report No. ASSDV112, ASTIA No. AD-458 255; February 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5101. FUJIMOTO, K., "Active Antennas: Tunnel-Diode-Loaded Dipoles," Proc. IEEE, vol. 53, no. 2, p. 174; February 1965. ABSTRACT: The concept of antenna structure, which is classically defined as being passive, reciprocal, linear, and invariable with time is being extended to include active, nonreciprocal, nonlinear, and time-variable characteristics. As one step toward realizing this more general concept, antennas combined with receiver and transmitter systems employing solid-state devices have been studied and their usefulness has been reported. Interest in this area has been steadily growing and the rather extensive work is a measure of the significance of integrated systems. It is the object of this correspondence to report some additional results obtained for a tunnel-diode-loaded dipole antenna. (a-1, b-1, c-1, d-1, e-0, f-Experimental results with "antennafier")

5102. SCHRANK, H. E., HOOPER, W. P., AND DAVIS, R. S., "A Study of Array Beam Switching Techniques," Westinghouse Defense and Space Center, Baltimore, Maryland, Project No. 4506, Contract No. AF 30(602)3394, ASTIA No. AD-459 585; February 1965. ABSTRACT: Array beam switching techniques are an important part of devising improved multibeam systems. The purpose of this contract is to provide a handbook of array beam switching as the final report. The handbook will attempt to collect, generate and organize information which will aid in the optimization of multibeam systems. The first quarterly progress report discussed the objectives, scope and course of action of the program as well as the progress for the first quarter. The second quarterly progress report discusses special areas of interest in array switching and continues the survey of array antenna systems. The followings topics are discussed: Switching Configurations, Hybrid Matrix Switch, Ferrite Devices, Diode Switch; Tube Switches, Latching Ferrite Phase Shifter Drivers Components. (a-1, b-3, c-1, d-1, e-0, f-Study)

5103. SESHADRI, S. R., "Radiation from an Electric Dipole in a Plasma Column," Proc. IEE, vol. 112, no. 2, p. 249; February 1965. ABSTRACT: The radiation characteristics of an axially oriented electric dipole in an isotropic plasma column are investigated. Surface waves are found to be excited for frequencies of less than $1/\sqrt{2}$ times the plasma frequency. The dependence of the power carried by the surface wave, as well as that carried by the space wave, on the frequency and the radius of the plasma column is examined. The surface waves are found to be excited with maximum efficiency at about half the plasma frequency. The radiation pattern in the far zone is evaluated and found to have, in general, a maximum in the broadside and a null in the end-fire directions. The normalised radiation resistance is found to

vary as the square of the frequency for small column dimensions and high frequencies. (a-1, b-1, c-1, d-5, e 0, f-Theory)

5104. SMITH, R. S., "Electronic Observers for Radio Direction Finding," Electrical Engineering Research Lab., University of Illinois, Contract Nos. NObsr-64723, NObsr-89229, ASTIA No. AD-613 039; February 1965. ABSTRACT: Automated bearing readout methods are investigated for the Wullenweber wide-aperture radio direction finder, with particular attention to the effects of amplitude modulation on bearing readout. An examination of a generalized RDF system is given to show the potential effects of the various components on bearing readout accuracy, and the state of the art in RDF systems and readout methods is reviewed. The system to be used for this study, the Wullenweber wide aperture set, is described in detail, noting the pertinent characteristics for this study. Some statistical characteristics involved in readout problems are discussed and the three basic requirements for the application of Wiener's work in time series are noted, along with the nature of the output ensemble from the D/F receiver. Tchebysheff's inequality is applied to the prediction of sample size requirements, and some sampling rate considerations are noted in the light of the predicted sample sizes. (a-1, b-3, c-1, d-1, e-954, f-See Abstract No. 4761)

5105. WILLIAMS, R. H., "Insulated and Loaded Loop Antenna Immersed in Conducting Medium," J. Res. Nat. Bur. Stand., vol. 69D, no. 2, pp. 287-289; February 1965. ABSTRACT: Theoretical analysis of loop antenna in spherical insulating cavity to determine effect of permeable core loading of loop; it is shown that effective area of loop is increased when it is loaded with spherical permeable material; effects of conducting medium are negligible. (a-3, b-1, c-1, d-1, e-0, f-Theory and analysis)

5106. KEATS, E. S., "Navigational Satellites-Beacons for Ships and Planes," Electronics, vol. 38, no. 3, pp. 79-86; 8 February 1965. ABSTRACT: Brief review of presently available navigational aids and their shortcomings; system proposed uses satellites equipped with gravity-gradient altitude control, solar cells to supply power, interferometer antennas for measurement of direction, radar and helical antennas and sensors; methods for measuring distance and direction. (a-1, b-2, c-1, d-1, e-0, f-Review)

5107. ANONYMOUS, "Status Report, Reduction of Shipboard Radio Interference," Ohio State University, Columbus, Ohio, Contract No. N123(953)31663A, ASTIA No. AD-458 397; 23 February 1965. ABSTRACT: The purpose of this contract sponsored by The Naval Electronics Laboratory, is the study of antennas in shipboard environments at frequencies of 2-30 mc. The disturbance of radiation patterns by superstructure and other obstacles, and the reduction of mutual coupling between antennas represent the two main problems for study. The first problem, that of pattern disturbance caused by superstructure, has been approached by approximating the radiating source by an infinitely long line source, and the offending structure (of arbitrary shape) by an array of thin infinitely long wires outlining its surface. Such a cylindrical configuration approximates many practical shipboard situations and provides some basis for the location of antennas aboard ship. The second problem, that of radiation interference in the close confines of a ship, was approached via the characteristic mode concept. Very briefly, this approach presumes that the radiation patterns of antennas located on a hull (at the low frequencies under discussion) are a sum of simpler patterns which are characterized by the hull shape alone. It was felt that the delineation of these patterns, or modes, could aid the decoupling problem if they were found to be orthogonal. They also could be used as a tool in aperture synthesis techniques and array design. Both foregoing problems are reviewed. (a-1, b-2, c-1, d-1, e-0, f-Review and analysis)

5108. WILLIAMS, C., "Improved Transportable H.F. Direction Finder Set," Servo Corp., of America, Hicksville, New York, Contract No. DA 36-039-AMC-03706(E), Quarterly Progress Report No. 3, ASTIA No. AD-458 401; 25 February 1965. ABSTRACT: This work covers the work completed by Servo Corporation of America during the third quarter, on the design and development of an Improved Transportable H.F. Direction Finder. The specific tasks discussed are as follows: (1) The rf and dc control circuits of the fiberglass antenna were modified to improve the performance in the elimination of cross modulation and improved electrical height selection; (2) Final design and instrumental accuracy data on the azimuth indicator is presented; (3) Fabrication of the new goniometer-commutator chassis was completed and is described; (4) The antenna sequential switch was completed during this period and is discussed; (5) Further results in the investigation of commutator blending law improvement are presented and discussed; and (6) The entire system is now entering field testing. (a-1, b-3, c-1, d-1, e-796, f-Progress report)

5109. DAVIES, D. E. N., AND McCARTNEY, B. S., "Cylindrical Arrays with Electronic Beam Scanning," Proc. IEE, vol. 112, no. 3, p. 497; March 1965. ABSTRACT: This paper describes methods for enabling the directional pattern of a cylindrical array to scan continuously and repetitively through 360° by electronic means. This requires that the circular aperture distribution corresponding to the far-field directional pattern should be subjected to rotation relative to the fixed array. Methods are described for independent control of the amplitude and phase of the aperture distribution in order to synthetise suitable forms of directional pattern. Certain theoretical and practical limitations on the proposals are also discussed. The techniques are applicable, in principle, to both transmission and reception; a brief discussion of the relevance of the proposals to radar and sonar is also given. (a-1, b-1, c-1, d-5, e-0, f-Description)

5110. EHRREICH, J. E., AND NIMOY, M., "R.F. Shielding Performance of Reinforced Metal-Filled Conductive Plastic Flat Gaskets," Trans. IEEE, vol. EMC-7, no. 1, pp. 50-54; March 1965. ABSTRACT: A paper presented at the Fifth Annual Symposium introduced this group to the remarkable R.F. shielding potentials of the electrically conductive plastic materials based on the new types of spherical metal fillers. It was stated in this paper that the conductive plastics have volume resistivities as low as 10^{-5} ohm centimeters and, when properly used in a flange, would give total attenuations in the range of 75 to 100 db over the frequency range of 50 kc to 10 Gc. Further testing during the past year has established that these are conservative figures. The conductive materials, because they have a plastic base, permit a great variety of specific end products, with a wide range of physical properties, to be produced for R.F. shielding applications. The conductive plastics are available in the form of R.F. caulking compounds, adhesives and gaskets. The gaskets may be molded or die-cut, reinforced or unreinforced - and in addition, may be used to make integral structures with conventional insulating plastics. The present paper will concern itself with only one form of the conductive plastics - one developed for use with rigid mating surface-high closure force flanges. (a-1, b-1, c-1, d-1, e-0, f-Shielding technique)

5111. GALEJS, J., "Admittance of Insulated Loop Antennas in Dissipative Medium," Trans. IEEE, vol. AP-13, no. 2, pp. 229-235; March 1965. ABSTRACT: Computation of admittance of loop antenna using two-term trial function for loop current in variational formulation; thin insulating layers tend to maintain nearly uniform current around small loop, in particular for high-lossy surrounding media; assumption of uniform loop current is shown to be justified for range of antenna parameters. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

5112. ROW, R. V., "Insulated Loop Antenna in Conducting Spherical Shell," Trans. IEEE, vol. AP-13, no. 2, pp. 216-218, March 1965. ABSTRACT: Computation and analysis of impedance of loop inside conducting spherical shape; attention is focused on change in impedance of electrically small wire loop when it is placed inside spherical shell of lossy dielectric material whose radius is small compared to free-space wavelength; self-impedance in absence of shell can be calculated separately. (a-3, b-1, c-1, d-1, e-0, f-Analysis)

5113. ANONYMOUS, "Net Controlled HF/DF Equipment," Sylvania Electronic Products, Inc., Mountain View, California, Final Development Report, Contract No. NObsr-89237, ASTIA No. AD-460 646; 1 March 1965. ABSTRACT: All NCDF equipment changes that have taken place between 15 July 1964 and 23 December 1964 (equipment delivery date), which affect the functional description of the NCDF equipment either at the system or unit level, are described in Part I of this report, along with the revised functional descriptions. Also included in Part I are detailed descriptions of specific NCDF design problems, and the solutions applied to these problems. The conclusions derived from design investigations are also outlined. Part II of this report presents specific recommendations for improvement of NCDF chassis. As shown by the distribution of the recommendations, the analog portion of the receiver is the only major equipment area wherein significant improvements could be made in a production model. Part III of this report provides statistical reliability data for the NCDF equipment. Included are failure rate and MTBF (mean time between failures) data for all NCDF units and printed circuit cards, as well as samples of the dc circuit analyses employed in the MTBF calculations. Also included in Part III are appendices containing a master table of contents, master list of illustrations, and master list of tables, to facilitate the location of data contained in the interim development reports. (a-1, b-3, c-1, d-1, e-838, f-See Abstract No. 5023)

5114. ANONYMOUS, "Radio Direction Finding Below 300 Mc: A Report Bibliography," Defense Documentation Center, ASTIA ARB-No. 051591; 10 March 1965. ABSTRACT: Bibliography of unclassified

documents pertaining to the ionosphere and ionospheric research. (a-4, b-3, c-1, d-1, e-0, f-Bibliography)

5115. SVOBODA, D. E., "Phase and Amplitude Control for Arrays with Increased Directivity," Ohio State University, Columbus, Ohio, Report No. 1556-16, Project No. 6278, Contract AF 33(657)10386, ASTIA No. AD-461 633; 10 March 1965. ABSTRACT: Research concerns techniques for integration of active elements into antennas and antenna structure. A technique for improving the accuracy with which amplitude and phase distributions for super-directive receiving arrays can be held is described. This technique makes use of an RF reference signal in conjunction a phase-locked error-correcting system. Measurements made on three- and four-element arrays to evaluate the technique are discussed. A method is presented for determining required amplitudes and phases to produce a given pattern for receiving array elements when individual rf amplifiers are used. The basic idea of an N-element array using automatic amplitude and phase control is illustrated by a block diagram. The phase and amplitude of the RF reference signal appearing in each channel at the phase and amplitude control circuitry is accurately measured to determine its deviation from prescribed values for that channel. Error voltages are fed back to an electronically controlled attenuator and an electronically controlled phase shifter. The phase- and amplitude-corrected signals are sampled and summed in a summing network. (a-1, b-3, c-1, d-1, e-0, f-Description)

5116. CROW, G. L., "Results of Continuous Wave Interferometer Multiple-Target Tests," Defense Research Lab., University of Texas, Report No. DRL-529, Contract No. NOrd-16498, ASTIA No. AD-360 028; 16 March 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5117. SHERRILL, W. M., "Polarization Measurements of the Decameter Emission from Jupiter," Southwest Research Institute, San Antonio, Texas; 18 March 1965. ABSTRACT: Polarization characteristics of the Jovian decameter emission for the period September, 1963, through January 7, 1964, were measured at 15.5, 16.2, 18.2, 22.2, and 24.2 mc. Use of an expanded two helix polarimeter has permitted determination of axial ratio and polarization fraction of the bursts for the observing frequencies greater than 15.5 mc. Right-hand polarization was found to dominate all observed frequencies with the majority of bursts above 15.5 mc indicating axial ratios more circular than 0.7 with polarization fraction generally greater than 0.8. However, an increasing incidence of left-hand and random-linear bursts was observed with decreasing observing frequency. No clearly defined trend in axial ratio as a function of Jovian source longitude was seen in these observations. (a-1, b-3, c-1, d-1, e-1000, f-Measurements)

5118. ANONYMOUS, "Why VLF," Electronic Design, vol. 10, no. 4; 29 March 1965. ABSTRACT: The demand for greater bandwidth by commercial broadcasters during the 1920's contributed to abandonment of all work in the 10- to 30-Kc VLF spectrum. (a-4, b-2, c-1, d-1, e-0, f-Historical survey)

5119. ANONYMOUS, "Development of ECM ASW Detection and Classification System," Local Electronics Systems, New York, Final Summary Report, Report No. 7019-5, Contract No. NOw-63-079-5, ASTIA No. AD-363 318; 31 March 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5120. WEBB, H. D., "Ionospheric Research," University of Illinois, Electrical Engineering Research Laboratory, Urbana, Illinois, Contract DA 36-039-AMC-03703(E), Quarterly Progress Report No. 6, ASTIA No. AD-618 708; 31 March 1965. ABSTRACT: Moon reflected signals were received on 46 days during the quarter, for 382 hours at 150.6 mc. Signals at 413.25 mc were also received during 44 of the observation days, so that the total Faraday rotation angle could be resolved on those days. Diurnal average curves for observation periods in September, October, November and December, 1964, are presented. A master's thesis study dealing with the correlation of electron content irregularities and irregularities in the horizontal component of the earth's magnetic field is nearing completion. Using quantitative data from correlated irregularities, velocities of motion of ionospheric disturbances have been calculated which fit a 12-hour cycle. A thesis for the M.S. degree dealing with a comparison of methods of resolving the n × 180 degree ambiguity of the Faraday rotation angle is presented. Several new M.S. thesis studies have been started. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

5121. ANONYMOUS, "Spectrum Signature Data of Direction Finder Set AN/ARN-59. Serial Numbers 839, 945, and 1074," Pan American World Airways, Tucson, Arizona, Report No. ASSDV-121, Project No. 106-20501D449-02, Contract No. DA 02-086-AMC-0032(R), ASTIA No. AD-462 640; April 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5122. CARR, A., "The Navigation of the Green Turtle," Scientific American, vol. 212, no. 4, p. 79; April 1965. ABSTRACT: Article with biotelemetric applications to turtles so as to study their habits. (a-4, b-2, c-1, d-1, e-0, f-Biotelemetry)

5123. EARP, C. W., "Features of a New Doppler VOR Beacon," Proc. IEE, vol. 112, no. 4, p. 698; April 1965. ABSTRACT: The paper describes the particular features of a recently developed Doppler VOR beacon which permits compatibility with conventional VOR receivers, without impairment of instrumental accuracy. Various reasons are given for the limited success of early DVOR beacons, and measures are described to eliminate their weaknesses. It is shown that the new beacon does not necessarily need any modification for the effective provision of multilobe technique. Hence, when used with a modified form of airborne receiver or a conventional VOR receiver plus attachment unit, a new order of instrumental accuracy can be achieved. Two types of receiver attachment are described, one involving a small modification of the beacon, but making adaptation to receivers already in use more practicable. (a-1, b-1, c-1, d-5, e-0, f-Description and evaluation)

5124. GRIFFITHS, L. J., AND BARRY, G. H., "The Effect of Ground-Level, Atmospheric, and Deep Space Explosions on HF Radio Waves in the Ionosphere," Stanford Electronics Laboratories, Stanford University, California, Final Technical Report, Contract No. AF 33(657)12901, ASTIA No. AD-359 872; April 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5125. RENARD, C., AND FAYARD, C., "Study of VLF Radiation by Use of a Nike-Cajun Rocket," Centre National D'Etudes Des Telecommunications, Technical Report, Contract No. AF 61(052)571, ASTIA No. AD-619 250; April 1965. ABSTRACT: The payload of a Nike-Cajun Rocket launched at Wallops, Virginia, consisted of equipment developed to measure the magnetic field in the ionosphere of a VLF wave radiated by the Annapolis Transmitter (NSS) on 22.3 kc/s. After the measurement principles have been exposed, a detailed description of the equipment is given and the telemetry results are analysed. In spite of an antenna effect on the loops, an approximate measure of the VLF field in the whistler mode between the D and E layers is given. An analysis of the propagation above Wallops Island is carried out, which allows the development of the processing of the Doppler effect observed on the VLF wave received in the ionosphere. The electron density profile obtained between 70 and 100 km is analysed and shows two layers at 78 and 87 km. (a-1, b-3, c-3, d-3, e-0, f-Experimental results)

5126. VASIL'YEV, Y. N., AND SEREGINA, A. R., "Radiation Pattern of Slot Antenna on a Thick Cylinder of Finite Length," Tele. Comm. and Rad. Eng., vol. 20, Part 2, no. 4, p. 97; April 1965. ABSTRACT: Expressions for the radiation patterns of a transverse slot antenna on a thick cylinder of finite length are analyzed. The field in the slot is assumed axially symmetric. The cases of a slot on the base surface and on the cylindrical surface are considered separately. (a-1, b-1, c-1, d-2, e-0, f-Theory)

5127. SHERRILL, W. M., AND TRAVERS, D. N., "Shipboard Siting of Direction Finders for the 3 to 30 Mc Range," Southwest Research Institute, San Antonio, Texas, Report No. SR-19, Project No. SF001-0801, Contract No. NObsr-89167, ASTIA No. AD-615 172; 2 April 1965. ABSTRACT: The report summarizes the practical requirements for siting radio direction finders operating in the 3 to 30 mc range and is intended primarily for the use of personnel responsible for site selection and D/F antenna installation on Naval ships. The effects of reradiation from the ship's superstructure on direction finder performance are described. By the use of specific examples of shipboard installations, the merits of various siting compromises are discussed. (a-1, b-3, c-1, d-1, e-1000, f-See Abstract No. 5071)

5128. MARTIN, P. E., LORENZ, R., AND TRAVERS, D. N., "Circular Arrays of Beverage Antennas for High Frequency Direction Finding. Interim Development Report for a Study Technique to Produce a High Frequency Land Based Direction Finder Utilizing Traveling

Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, San Antonio, Texas, Contract No. NObsr-89345, ASTIA No. AD-462 009; 15 April 1965. ABSTRACT: The construction of the 360 input solid state commutator has continued to require the major portion of the effort during the past quarter. Six modules of 30 inputs each and a master control unit have been completed, tested and are now operational at the Beverage array site. A pattern study now under way, using two 180 input RF commutators connected in parallel to the inner feed points of the array of 27 meter long elements has been primarily devoted to experimenting with the outputs of the two commutators differentially connected. By such technique a null is formed in the azimuthal direction of arrival of signal. . results obtained by the difference connection and inverted nu [illegible] are very encouraging and it appears that a significant improvement in array performance can be obtained on skywave signals. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5129. ANONYMOUS, "Conduct Operational Evaluation of the ALD-2B ECM Equipment," Operational Test and Evaluation Force, Norfolk, Virginia, Project No. 0-V50FY6, ASTIA No. AD-360 087; 28 April 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5130. ANONYMOUS, "Direction Finding Techniques in VHF-UHF," Goodyear Aerospace Corporation, Litchfield Park, Arizona, Report No. GERA-97[illegible] Project No. 4028, Contract No. AF 33(615)1942, ASTIA No. AD-360 1[illegible] April 1965 ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5131. ANONYMOUS, "Phased Array Study," Hughes Aircraft Co., Fullerton, California, Report No. FR-65-14-72, Project No. SR0080302, Contract No. NObsr-89427, ASTIA No. AD-614 921; 30 April 1965. ABSTRACT: A ten element phased array using semiconductor diode phase shifters has been designed and tested at S-band. The design has emphasized maximum phase shifter capability for ultimate use in medium and high power phased array radar system applications. A hybrid coupled bit circuit was employed as the basic phase shifting circuit. The phase shifter circuit and diode were optimized to achieve high pulsed power capability with low insertion loss. The optimization procedure has lead to the use of a large junction capacitance diode operating in a low impedance circuit. Phase shifters were tested to a level of 5 kw peak and 200 w. average with no limiting or instabilities occurring. The diode bit insertion loss contribution was 1.3 db. Radiation pattern tests of the assembled antenna array showed side-lobe levels of between 20 and 25 db for most all cases over a beam scan range of ±50 degrees. Phase shifter performance in the antenna array with regard to amplitude and phase errors was such as to produce pattern errors which were 10 to 15 db below the isotropic level. This allows the attainment of low side-lobe levels and a negligible reduction in antenna gain due to aperture errors. The experimental phase module design has lead to a proposed practical package employing the principles of the experimental module. The new design will be developed under a contract with the Navy Bureau of Ships. (a-1, b-3, c-1, d-1, e-0, f-Project summary)

5132. DEHART, W. R., HUGGETT, W. K., LEE, R. E., FILKINS, L., AND ANDERSON, R., "Investigation of a Hyperbolic Position-Locating Assembly," Radio Science Laboratories, University of Michigan, Ann Arbor, Michigan, Quarterly Progress Report No. 2, Contract No. DA 28-043-AMC-00295(E), ASTIA No. AD-360 910; May 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5133. IIZUKA, K., "A Technique for Measuring Mutual Admittances of Antennas," <u>Trans. IEEE,</u> vol. AP-13, no. 3, p. 469; May 1965. ABSTRACT: The increased complexity of aerials demands a greater accuracy in the measurement of mutual admittance between elements. Three previous methods of doing this are mentioned with their shortcomings. This paper describes a method related to the above methods in principle but which uses an image plane in order to avoid the simultaneous adjustment of both phase and amplitude of the driven current. A sketch shows an experimental arrangement for measuring the self- and mutual-admittances of two identical monopoles over a ground plane. The mathematics are given and the method of making the two measurements necessary. (a-3, b-1, c-1, d-1, e-0, f-Theory)

5134. ANONYMOUS, "Doppler Satellite for Army Field Operations," Westinghouse Electric Corp., Surface Division, Baltimore, Maryland, Final Technical Report, Contract No. DA 44-009-AMC-573(X), ASTIA No. AD-470 472; May 1965. ABSTRACT: Results are given for field tests conducted during the summer of 1964 on a relative position determination system employing Doppler cycle count data recorded from satellite transmissions at a master station of known location and an unknown remote station. Sixty passes were recorded involving 2 satellites in polar, near-circular orbit; measurements were taken at a single master station and 3 remote stations. The separation between pairs of stations varied from 10 to over 200 nautical miles. Descriptions of the receiving, recording and timing equipment and the field test setup are given. A tabular chart summarizes the absolute errors of the calculated positions of each station. The final residual position error at each remote station after application of the relative position corrections, and the results of attempts to improve accuracy by a limited refinement of one orbital parameter and satellite transmission frequency by a differential correction process employing data taken at the known master station. (a-1, b-3, c-1, d-1, e-0, f-Test report)

5135. ANONYMOUS, "Two Dimensional DF Techniques," American Electronic Laboratories, Colmar, Pennsylvania, Final Report No. 500115, Contract No. AF 30(602)2952, ASTIA No. AD-362 558; May 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5136. BLYMILLER, A. L., NARDOZZA, V. J., AND SNODGRASS, J. E., "Test and Evaluation Program for the High Frequency Luneberg Lens Direction Finder," Rome Air Development Center, Griffiss AFB, New York, Technical Report, Report No. RADC TR-65-181, ASTIA No. AD-363 682; May 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5137. FENWICK, R. C., "A New Class of Electrically Small Antennas," <u>IEEE, Trans.</u>, vol. AP-13, pp. 379-383; May 1965. ABSTRACT: Description of a new class of electrically small antennas, the principal advantages of which are the resistive input impedance, the radiation resistance transformation which may be obtained within the structure, and the variety of shapes which the antennas may take. The antennas incorporate resonant half-wave windings, and a simple transmission-line theory is presented by which antenna efficiency and bandwidth can be calculated. Experimental methods and results are described for antennas on the order of 0.01 wavelength in height and 0.05 wavelength in diameter. (a-1, b-1, c-1, d-1, e-0, f-Description)

5138. MEI, K. K., "On the Integral Equations of Thin Wire Antennas," <u>Trans. IEEE,</u> vol. AP-13, no. 3, pp. 374-378; May 1965. ABSTRACT: The feasibility of direct numerical calculations of aerial integral equations is investigated. It is shown that an integral equation of Hallen's type is the most adequate for such applications. The extension of Hallen's integral equation to describe thin wire aerials of arbitrary geometry is accomplished, and results are presented for dipole, circular loops, and equiangular spiral aerials. (a-1, b-1, c-1, d-1, e-0, f-Theory)

5139. MAXWELL, E. L., AND STONE, D. L., "10 Kc/s Atmospheric Noise Predictions," DECO, Electronics, Inc., Boulder, Colorado, Contract Nonr-410-700, Report No. 54-F-2, ASTIA No. AD-615 923; May 1965. ABSTRACT: This report contains a full set of atmospheric noise prediction maps for 10 kc/s. The procedure involved in transferring the 1 megacycle maps given for local time and seasonal periods in CCIR Report 322 to 10 kc/s maps given in Universal Time for three month periods is described in this report. A new approach to the prediction of VLF atmospheric noise was begun under this program and preliminary results are presented herein. The presentation of the CCIR data on a universal worldwide scale for a particular three month period revealed serious shortcomings and obvious disagreements with noise source and VLF propagation characteristics. The new technique begun makes direct use of noise source and propagation information. The preliminary results indicate that this technique may offer considerable advantages in the VLF range. (a-1, b-3, c-1, d-1, e-0, f-Sferics)

5140. NATHES, R. H., AND RICALZONE, L. C., "Toward the Elimination of Ocean Environment Variations in Integrated Detection, Localization, and Attack Systems," Naval Research Laboratories, Washington, D.C., Interim Report, NRL Report No. 6247, ASTIA No. AD-361 630; 3 May 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5141. HILDEBRAND, V. E., "More About Superdirective Antennas for LF and VLF," Naval Ordnance Laboratories, Corona, California, Report No. NOLC-624, ASTIA No. AD-464 284; 28 May 1965. ABSTRACT: An equation for the n-loop superdirective antenna is derived which is more general than those previously developed and allows considerably greater flexibility in the selection of minor-lobe characteristics. A number of examples of specific antenna patterns are presented and

evaluated for different applications. It is shown that, with a four-loop antenna, a front-to-minor-lobe ratio greater than 60 db over a 130 deg sector can be obtained and, with a five-loop antenna, a ratio of 67 db with all minor lobes equal can be achieved. Additionally, the pattern characteristics are maintained over a 3:1 bandwidth; however, the antenna effective height changes significantly over this bandwidth. (a-1, b-3, c-1, d-1, e-0, f-Theory)

5142. FERRARO, A. J., AND LEE, H. S., "The Measurement of Phase and Amplitude Radio Wave Interaction at University Park, Pennsylvania, for January-February-March 1965," Pennsylvania State University, Ionosphere Research Laboratory, University Park, Pennsylvania, Scientific Report, Report No. SR-239, Contract No. AF 19(628)4014, ASTIA No. AD-618 213; 30 May 1965. ABSTRACT: The objective of the present work is to study the properties of ionospheric D-region using radio wave interaction effect which is also commonly known as Luxembourg effect. The present technique closely follows that developed by Fejer for radio wave amplitude interaction experiment. However, the technique of measurement as well as the theory of radio wave interaction have been extended and generalized at the Ionosphere Research Laboratory by the introduction of complex coefficient of interaction T, to embody the effect of interaction on both the amplitude and the phase of radio waves. (a-1, b-3, c-1, d-1, e-0, f-Theory)

5143. ANONYMOUS, "Techniques for Integration of Active Elements into Antennas and Antenna Structure," Ohio State University, Antenna Laboratory Research Foundation, Columbus, Ohio, Interim Engineering Report No. 1677-19, Contract No. AF 33(657)10386, ASTIA No. AD-467 423; 31 May 1965. ABSTRACT: Solid-State Transmitting, Receiving and R. F. Switching Circuitry - Integrated Antenna, Transmitter, and Receiver Design - 1000 Mc slot antennafier; Multiport archimedes spiral antennafier; Phase-locked antennafier array; Continuous source with increased directivity: Direction Finding. (a-5, b-3, c-1, d-1, e-0, f-Progress report)

5144. GENTRY, D. E., AND JENKINS, H. H., JR., "Error Reduction in Loop Direction Finders," Georgia Institute of Technology, Report No. A-842-1, Project No. DA5A67919D902, Contract No. DA-28-043-AMC-01207(E), ASTIA No. AD-469 916; 31 May 1965. ABSTRACT. In this first quarterly report, project purposes and objectives are defined. A brief review of the problem of bearing errors in vertical loop antenna direction finders is presented with emphasis on the effects of the horizontal component of an abnormally polarized field, such as the ionospheric wave, incident on the loop. The block diagram of a dual-channel receiving system designed to reduce bearing errors caused by horizontally polarized waves is described. One channel will sense the nulls of a continuously rotating loop antenna and display the bearings on a CRT. The other channel will sense the horizontally polarized component of the field at the loop and will gate out the signal from the other channel when the horizontal component of the field exceeds a threshold. In this manner errors in the displayed bearing information will be reduced. Detailed descriptions of five sub-systems are presented with emphasis on general performance requirements. Anticipated technical problem areas are discussed with emphasis on the effects of: (1) the low radiation resistance of small antennas; (2) null detection threshold accuracy on bearing error; and (3) square-law detection on null reproduction. Described are the results of an experimental investigation which show that the AGC voltage of a closed loop AGC system may provide optimum reproduction of the loop antenna nulls. (a-1, b-3, c-1, d-1, e-0, f-Project outline)

5145. TITUS, D. C., "Synthetic Aperture Position Finding Technique," Keltec Industries, Inc., Alexandria, Virginia, Final Report, Contract No. DA 28-043-AMC-00237(E), Report No. FR-1250-000-1, ASTIA No. AD-365 669; 31 May 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5146. TRAVERS, D. N., CASTLES, M. P., AND SHERRILL, W. M., "LF to VHF Surface Ship Direction Finding Research," Southwest Research Institute, San Antonio, Texas, Interim Development Report, Contract NObsr-89167, ASTIA No. AD-465 791; 31 May 1965. ABSTRACT: A brief description of the new AN/BRD-4 technical manual format is given including a topic outline and estimate of progress The newly modified automatic direction finder calibrator equipment has undergone design for 50% reduction in size and weight and is now ready for use. A demonstration of the General Precision Industries AN/FRR-68 phase matched twin/triple channel receiver was held by GPI representatives at Southwest Research. During the demonstration it was revealed that the receiver was not designed for amplitude comparison D/F applications; however, modifications were described which can be implemented at minimum cost. The receiver equalled or exceeded the applicable specifications detailed in the SwRI report dated 29 February 1964. The shipboard test model of the 5-foot diameter crossed spaced loop antenna is scheduled for delivery from Astro Mechanics Inc., Austin, Texas in mid-June 1965. The final design includes horizontal shorting bars in the axial plane and other refinements including varactor diode tuning. This network permits bearing sensitivities equal to or in excess of minimum requirements (as previously defined) over the 2-30 mc frequency range of the system. Estimated delivery date for the Intercept Research IR-3 triple channel receiver is now 1 July 1965. Travel plans have been made to visit Intercept Research, Inc., immediately prior to receiver shipment. The receiver is complete and is being tested at this time; the manufacturer has requested time to correct certain deficiencies. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5147. ANONYMOUS, "Correction to D.T. Geiser's Paper: 'A Method of DF Error Correction'," Trans. IEEE, vol. EMC-7, p. 242; June 1965. ABSTRACT: This is a notice of correction to a figure diagram in originally published paper. (a-4, b-1, c-1, d-1, e-810, f-Erratum: See Abstract No. 5046)

5148. ADAMS, A. T., AND LYON, J. A. M., "Ferrite Loaded Antennas for Aerospace Applications," Trans. IEEE, vol. AS-3, no. 2, Suppl., pp. 489-494; June 1965. ABSTRACT: The effects of ferrite loading on the characteristics of the rectangular cavity slot aerial, the equiangular spiral and the log conical spiral aerial are studied. Size and weight reduction is accomplished at the expense of band-width and/or efficiency. The characteristics of the rectangular cavity slot aerial are analyzed and compared with experimental data. The operating frequency may be shifted by magnetic bias. Loading the spiral and log conical aerials lowers the low frequency limit by a factor of two or three. Data are presented on the temperature sensitivity of ferrite materials for aerospace aerials. (a-1, b-1, c-1, d-1, e-0, f-Ferrite application)

5149. DRANE, C. J., "Directivity and Beamwidth Approximations for Large Scanning Dolph-Chebyshev Arrays," Air Force Cambridge Research Laboratories, Bedford, Massachusetts, Physical Sciences Research Papers, Report No. AFCRL-65-472, ASTIA No. AD-619 808; June 1965. ABSTRACT: Directivity and beamwidth for radiation patterns corresponding to the optimum Dolph-Chebyshev design have heretofore been determined by means of formulas that, although exact, are intractable to computation and not particularly open to physical interpretation. Approximate but accurate formulas are presented here in closed form, for the purpose of easy examination and computation of directivity and beamwidth for large scannable Dolph-Chebyshev arrays. Array length, number of array elements, the spacing of these elements, and the sidelobe level desired are parameters in this study. The maximum achievable directivity for Chebyshev arrays is in principle limited, regardless of how large the array becomes. Data is given to establish the array length required to obtain a value of directivity at some prescribed level below the maximum value. Comparisons between exact and approximate theory are presented in graphical form in such a way as to illustrate the lower limits of array size for which the approximations are valid. Element spacings less than a half-wavelength are included in this study. (a-1, b-3, c-1, d-1, e-0, f-Theory and analysis)

5150. GRUSH, H. L., "An Investigation of a Digital Bearing Computer for a Small Aperture Radio Direction Finding System," University of Illinois, Radiolocation Research Laboratory, Urbana, Illinois, Report No. RRL 280, Contract No. Nonr-183402, ASTIA No. AD-623 177; June 1965. ABSTRACT: A small aperture radio direction finding system such as a Watson-Watt system is subject to large bearing errors because of the wave interference effect of two waves. By contrast, a large aperture system such as a Wullenweber system exhibits smaller errors under corresponding conditions. This work attempts to develop a practicable means of obtaining accurate bearing information using a small aperture system in the presence of strong wave interference. The technique used is the time averaging of instantaneous bearings. Thus, bearing information may be obtained with a small aperture system by using information available over an extended period of time. The computation of the bearing may be carried out on-line by a small general purpose digital computer. One of the unique features of the digital bearing computer developed here is its capability to adapt to changing input signal conditions. The adaptive capability makes it possible to optimize the averaging process. The process allows estimates of the indicated bearings of both the primary and the interfering waves and their relative strengths to be made. A mathematical model for the relative phase between the two waves is evolved which is not unlike that of the real phase function. The model yields a regular progression of phase plus a random perturbing component. The only

restruction placed upon the phase function is that its probability density function be essentially uniform. On the basis of the model of the phase function and the equations describing the operation of a small aperture system, the Watson-Watt system is simulated on a general purpose digital computer, and the digital bearing computer is evaluated. Further evaluation includes an experimental investigation. (a-1, b-3, c-1, d-1, e-898, f-Study and investigation)

5151. GUTKIN, L. S., "Comparison of Practicable and Potential Accuracy of Direction-Finding. I. Continuous Signals," Radiotekhnika, vol. 20, no. 6, pp. 52-63; June 1965. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-0)

5152. KENDALL, W. B., "Unambiguous Accuracy of an Interferometer Angle-Measuring System," Trans. IEEE, vol. SET-11, no. 2, p. 62; June 1965. ABSTRACT: In this paper we consider the problem of using signals received at three or four antennas to estimate the direction from which radio-frequency (RF) radiation is arriving. Though the results are couched in the terminology of angle measurements, they are applicable to any ambiguous measurements for which the number of ambiguities is inversely proportional to the accuracy. For an interferometric system the effect of receiver noise is examined. Then the optimum way to process the received waveforms, and the best spacing for the antennas, is determined. Next, signal-to-noise ratio (SNR) requirements are determined which must be met to insure that, with a given probability, the final unambiguous measurement is not in error by more than some specified amount. Finally, a comparison is made between a system which uses unambiguous measurements and a system which uses ambiguous measurements and then resolves the ambiguities. (a-1, b-1, c-1, d-1, e-851, f-Theoretical analysis)

5153. LO, Y. T., AND LEE, S. W., "Optimization of Signal-to-Noise Radio and Gain of Arbitrary Antenna Arrays," Proc. IEEE, vol. 53, no. 6, p. 6.5; June 1965. ABSTRACT: Before the invention of modern low-noise devices, the sensitivity of a system was largely limited by the noise in the preamplification stages. Today, as a maser amplifier can be designed to have a temperature as low as a few degrees Kelvin, the noise contribution from other parts of the system becomes of great importance, in particular the noise from the antenna. Unless extreme caution has been taken, this contribution may amount to ten or a hundred times that of the amplifier. Therefore, in such a circumstance the design criterion of the antenna must be reviewed. Work along this line has been done in recent years by researchers in radio astronomy, oceanography, and in acoustics. Most of the work, however, is limited to the case of a uniform background noise. For a nonuniformly distributed noise, which is the case of greater practical importance, the problem of maximizing the signal-to-noise ratio (SNR) seems to be considerably more difficult. In this communication, an analytical solution is presented, and some related problems are also discussed. (a-1, b-1, c-1, d-1, e-0, f-Theory)

5154. RADFORD, M. F., "On the Scale Modeling of Aerials," Point-to-Point Telecommunications, vol. 9, no. 3, p. 4; June 1965. ABSTRACT: The advantages and limitations of using small-scale models of aerials for impedance and polar diagram measurements are discussed. With models the operating conditions are more ideal than with full size aerials, but for this reason the picture of the performance which is obtained is more complete and accurate. (a-1, b-1, c-1, d-5, e-0, f-Antenna study)

5155. SHEREDYKO, E. Yu., "Calculation of Directional Properties of Surface Antennas with Linear, Squared, and Cubic Phase Distortions," Bull. Inst. Higher Education - Radio Engineering, vol. 8, no. 3; May-June, 1965. ABSTRACT: Not available. (a-4, b-1, c-2, d-2, e-0, f-0)

5156. WALTER, C. H., AND ROBERTSON, W. J., "Direction Finding Survey," The Ohio State University Research Foundation, Columbus, Ohio, Contract No. AF 33(657)10386, ASTIA No. AD-465 557; 30 June 1965. ABSTRACT: The general problem of determining direction of arrival of an incoming signal is considered and a number of direction finding systems are described. The emphasis is on systems suitable for airborne use in the frequency region 50 to 500 mc. Of the systems considered, a two-element interferometer is selected for further study. This system offers inherent bandwidth and basic simplicity but appears to suffer from poor signal-to-noise ratio. It is recommended that this system be studied further with the objective of obtaining improved performance through the use of antennafier techniques. (a-1, b-3, c-1, d-1, e-980, f-Study and investigation)

5157. JACOBS, E., "Polarisation of an Equatorially Mounted Antenna," Trans. IEEE, vol. AP-13, no. 4, p. 642; July 1965. ABSTRACT: It is pointed out that the polarisation angle of an equatorially mounted aerial changes in an azimuth-elevation coordinate system as the aerial is rotated, and this must be taken into account when terrestrial targets are used to measure aerial parameters. An expression for the polarisation dependency is derived. (a-3, b-1, c-1, d-1, e-0, f-Theory)

5158. KING, R. W. P., HARRISON, C. W., AND TINGLEY, D. G., "The Current in Bare Circular Loop Antennas in a Dissipative Medium," Trans. IEEE, vol. AP-13, no. 4, pp. 529-531; July 1965. ABSTRACT: The distribution of current in bare circular loop aerials has been evaluated from the theory of T. T. Wu. Computations have been made for loops in air and in an infinite homogeneous isotropic dissipative medium. Currents are shown graphically for loops with circumferences up to two wavelengths in media, with α/β ranging from zero to one, where $k = \beta - j\alpha$ is the complex wave number. (a-3, b-1, c-1, d-1, d-0, f-Theory)

5159. PADHI, T., "Theory of Coil Antennas," J. Res. Nat. Bur. Stand., vol. 69D, no. 7, pp. 997-1001; July 1965. ABSTRACT: In this paper, a method is presented by which the distribution of current on some structurally simple coil or multiturn loop antennas may be obtained. The input admittances of unshielded and shielded coils are determined and their operation as receiving elements is considered. (a-1, b-1, c-1, d-1, e-0, f-Theory)

5160. PETRIE, L. E., AND STEVENS, E. E., "An F1 Layer MUF Prediction System for Northern Latitudes," Trans. IEEE, vol. AP-13, no. 4, pp. 542-546; July 1965. ABSTRACT: Ionospheric propagation via the F1 layer is important for transmission distances in the 2000-3400 km range. Existing prediction systems yield large discrepancies between the predicted and observed F1 layer maximum usable frequencies (MUFs). An improved F1 layer prediction system has been developed which can be used for predicting the F1 layer MUF for latitudes greater than 40° North. Contour maps of zero distance F1 layer MUF and distances factors, for use with any sunspot number, are included for the prediction of the F1 layer MUF for April, June, August, and October. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

5161. SESHADRE, S. R., "Radiation from an Electric Dipole in an Infinite Column of Warm Plasma," Proc. IEE, vol. 112, no. 7, 1. 1279; July 1965. ABSTRACT: The radiation characteristics of an axially oriented electric dipole situated at the centre of an infinitely long, cylindrical column of warm plasma are investigated. Two types of surface waves are excited along the plasma column, and their dispersion and power relations are examined. The radiation pattern in the far zone and the radiation resistance arising from the space waves are evaluated, and their dependence on the source frequency and the radius of the plasma column is discussed. (a-1, b-1, c-1, d-5, e-0, f-Theory and discussion)

5162. TRAVERS, D. N., "Characteristics of Electrically Small Spaced Loop Antennas," Trans. IEEE, vol. AP-13, no. 4, pp. 639-641; July 1965. ABSTRACT: The free space field equations for a spaced loop are given and used to plot polar diagrams for pairs of loops with varying spacings for the vertical coplanar, coaxial, and intermediate configurations. Radiation resistance and gain are derived together with an expression for the minimum field, both for the lossless and the practical case. (a-3, b-1, c-1, d-1, e-1000, f-Theory)

5163. SIMMONS, B. E., (No Title), Syracuse University, Semi-Annual Progress Report, Report No. DSL-R-131, Contract No. Nonr-479800, ASTIA No. AD-365 399; 15 July 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See ASTIA Tab No. 65-20, p. A75)

5164. ANONYMOUS, "Operational Evaluation of the ALD-2B ECM Equipment," Operational Test and Evaluation Force, Norfolk, Virginia, Final Report, ASTIA No. AD-363 864; 19 July 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Test and evaluation)

5165. ANONYMOUS, "Propagation Medium RF Noise," Smyth Research Associates, San Diego, California, Interim Technical Report, Report No. SRA-466, Contract No. AF 33(615)2222, ASTIA No AD-468 437; August 1965. ABSTRACT: When a radio wave travels through a non-homogeneous medium, such as the atmosphere, distortions of the wave

front are caused by the medium. The first order effect of these distortions is to modify the apparent angle of arrival of the wave. If the distortions are large enough, amplitude modulation of the signal may result. The effects may be considered as noise in a system, since they result in a degradation of the information capacity of the system. The purpose of this study is to examine experimentally the magnitude and character of the noise and its effect on a typical communication system. The deterioration which is caused by moving the transmitting or receiving terminal will also be studied. The basic approach adopted for this study consists of the establishment of several high rate telemetry circuits over various paths, the measurement of statistical characteristics of the errors observed when a known signal is transmitted over these circuits, and the study of the relationships between these error statistics and the meteorological and topographical parameters that characterize the paths. (a-1, b-3, c-1, d-1, e-0, f-Noise analysis)

5166. ALEXANDER, F. G., AND VINCENT, O. G., "Horizontally Polarized Omnidirectional Radiation Close to a Conducting Plane," Air Force Inst. of Tech., Wright-Patterson AFB, Ohio, School of Engineering, Masters thesis, Report No. GE/EE 65-2, ASTIA No. AD-622 989; August 1965. ABSTRACT: A loop antenna is simulated by four end-fire arrays. The effects of three methods to increase the intensity of the E (tan) component of radiation near a conducting ground are shown. The theoretical basis for the three methods are given. A combination of two of the methods, namely, trapped modes in a dielectric slab excited by a parallel plane waveguide, given field patterns with major lobes near the plane of the ground. This combination shows promise of giving a gain of 14 db near the plane of a finite ground if no limitations on the length of dielectric are imposed. (a-1, b-3, c-1, d-1, e-0, f-Thesis)

5167. BAGHDASARIAN, A., AND ANGELAKOS, D. J., "Scattering from Conducting Loops and Solution of Circular Loop Antennas by Numerical Methods," Proc. IEEE, vol. 53, no. 8, p. 818; August 1965. ABSTRACT NO. 1: The integral equation of the current distribution along a circular loop antenna is solved by numerical methods. The integral equation is converted into a set of linear simultaneous equations, whose solution gives the desired current distribution. First, the loop antenna driven by a voltage source is considered and solutions to loops of various sizes are obtained. Secondly, current distributions are obtained for the loop as a scatterer illuminated by a plane wave. Finally, from the knowledge of the current on the illuminated loops, backscattering patterns are obtained for loops as a function of the rotation angle. The results of measurements for the latter case are also presented and compared with the calculations. ABSTRACT NO. 2: In theoretical studies of wire antennas of finite thickness, an integral equation is obtained for the current distribution along the antenna by solution of appropriate boundary value problems. Such equations have been obtained, for example, by Hallén for straight wire antennas, and by Storer and Adachi and Mushiake for circular loop antennas. Previous asymptotic solutions of such equations were then obtained by iterative methods which, in general, are quite involved. It is the purpose of this paper to illustrate the solution of one such equation - that of the circular loop antenna - by the method of numerical integration, and to obtain solutions to the problem of scattering from circular loops. The method of solution is readily applicable to other types of wire antennas, once the proper integral equation has been obtained. (a_1-1, a_2-1, b-1, c-1, d-1, e-0, f-Theory)

5168. BAHAR, E., "Model Studies of the Influence of Ionosphere Perturbations of VLF Propagation. Propagation of VLF Radio Waves in a Model Earth-Ionosphere Waveguide of Arbitrary Height," Colorado University, Department of Electrical Engineering, Boulder, Colorado, Technical Report, Contract No. CST7348, ASTIA No. AD-472 188; August 1965. ABSTRACT: The paper deals with propagation of radio waves in multimode waveguides of arbitrary height. The boundaries are assumed to be perfectly reflecting. For the case when the height of the multimode waveguide increases monotonically in the direction of propagation the required solution is obtained by a generalized quasi-optical approach which assumes that the waveguide consists of an infinity of infinitesimal radial waveguides cascaded together. To extend the solution for both directions of propagation, the reciprocity theorem has been employed, thereby accounting for reflections. The results have been applied to the study of VLF radio propagation when the effective height or reflection at the ionosphere varies along the path of propagation. Laboratory measurements obtained from a two-dimensional microwave model are compared with the theoretical solution to substantiate the analysis. (a-1, b-3, c-1, d-1, e-0, f-Propagation study)

5169. DEHART, W. R., DOSS, H., FILKINS, L., HUGGETT, W. K., AND LEE, R. E., "Investigation of a Hyperbolic Position-Locating Assembly," University of Michigan, Radio Science Laboratory, Ann Arbor, Michigan, Quarterly Progress Report No. 3, Contract No. DA 28-043-AMC-00295(E), ASTIA No. AD-363 983; August 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5170. HENDERSON, J. J., "Mismatch Correction Techniques for Twin-Channel Receivers," Radiolocation Research Laboratory, University of Illinois, Urbana, Illinois, ASTIA No. AD-625 826; August 1965. ABSTRACT: An integral part of a radio direction finding system, such as the Watson-Watt System, consists of two identical receivers, used to receive and amplify the differential output voltages of a crossed-Adcock antenna array. It is apparent that in actuality "identical" amplifiers are not physically realizable; and, consequently, errors in bearing result because of this inherent mismatch. The purpose of this study was to determine, by means of system simulation with a digital computer, the magnitude of this bearing error and to examine two techniques for the improvement or elimination of this error. This work was a logical extension of the investigation carried on by Grush, and a corrective test signal technique, such as the one to be discussed later in this paper, assumes a radio direction finding system which has an on-site, digital bearing computer. The words "receiver" and "amplifier" have been used interchangeably throughout this report, as the only function of the receiver which was of concern was its over-all property of amplification. (a-1, b-3, c-1, d-1, e-951, f-Study and investigation)

5171. MACPHIE, R. H., "Coherent Analog of the Intensity Interferometer," Proc. IEEE, vol. 53, no. 8, pp. 1142-1143; August 1965. ABSTRACT: About a decade ago, Hanbury Brown and Twiss published a description of the intensity interferometer for measuring the angular diameters of discrete radio sources. Their system consists of two widely separated receiving antennas whose terminal voltages, due to a discrete radio source, are individually square-law detected and then fed through low-frequency band-pass filters. This process destroys the RF phase information which is of central importance in a conventional Michelson-type interferometer. However, the fluctuations of the two square-law detected outputs are correlated, and if the two signals are brought together by a low-frequency transmission line and then multiplied and time-averaged, it can be shown that the system output is proportional to the absolute square of the mutual coherence function of the radio sources' incident field. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

5172. POKRAS, A. M., AND SIRENEV, V. S., "Compact Antenna with Directional Pattern Which Is Omnidirectional in the Horizontal Plane and Narrow in the Vertical Plane," Tele. Comm. and Rad. Eng., vol. 21, Part 2, no. 8, p. 99; August 1965. ABSTRACT: Results of work on the design of a multiunit antenna having a circular directional pattern in one plane and a narrow pattern in another plane are presented. The choice of the antenna element, element spacing and feed system is established. Some results of the final development of the elements and the electrical characteristics of the antenna as a whole are given. (a-1, b-1, c-1, d-2, e-0, f-Experimental results)

5173. SWAIN, G. R., "Antennas in or at the Surface of a Conducting Medium at VLF," Dissertation Abstracts, vol. 26, no. 2, pp. 956, Order No. 65-7691; August 1965. ABSTRACT: In order to characterize the behavior of subsurface antennas, the concepts of effective length, effective area, and gain are extended for use with antennas in or near a lossy medium. Driving-point impedance and radiating properties are investigated for parallel-plate and toroidal antennas which are situated in a highly conducting medium. Limitations on the performance of a toroidal antenna at the surface of a conducting medium are formulated. Merit factors such as effective length, equivalent area, effective area, and gain are applicable to antennas in conducting media provided the antennas are small enough that the magnitude of an incident wave does not appreciably decay in passing through the immediate neighborhood of the antenna. Equivalent two-port network parameters for a system of two antennas may be determined in terms of the effective lengths and driving-point impedances of the antennas, together with the field expression for an infinitesimal dipole in the medium assumed. The effective area of an antenna is related to the effective length and the input impedance of the antenna and also to the intrinsic impedance of the surrounding medium. The gain and effective area of an antenna are proportional, but the factor of proportionality depends on the configuration and properties of the medium and on the position of the antenna and its intended receiver (or transmitter). This dependence on the medium configuration and antenna positions has apparently been over-looked in the literature. The effective length of the parallel-plate antenna in a highly conducting medium is equal to the length of the insulated feed connection oriented perpendicularly between the closely spaced plates. Although the plates do not contribute to the received signal, they do serve to fix the

effective length and driving-point impedance at predictable values. The impedance of a parallel-plate antenna depends mainly upon the separation of the plates if the plates are large in diameter in comparison with a skin depth in the medium. On the other hand, the impedance depends mainly upon the bulk resistivity of the medium lying between the plates if the plates are small. Because the calibration of the parallel-plate antenna is easily determined, it is suitable for use as a reference to calibrate other antennas which sense the electric field in a conducting medium. The toroid antenna consists of a toroidal core of highly permeable magnetic material, upon which a uniformly distributed driving winding of low pitch is placed. The winding is assumed to be insulated from the core and from the surrounding highly conducting medium by thin layers of insulation. The antenna couples the driving winding to the surrounding conducting medium by what may be considered as transformer action, and produces an electric current moment. The driving-point admittance of the small toroid antenna is found to vary with frequency like a parallel R-L-C circuit. The effective length for the tuned toroid antenna is found to be independent of the characteristics of the conducting medium, and hence the toroid may be used as a probe for measuring the electric field in such a medium. The toroid antenna lying on the surface of a conducting medium produces a vertical electric current moment without projecting above the surface. The performance of the antenna is limited by the maximum voltage per turn, the maximum winding loss, the maximum pressure on the winding support, and, in the case when a ferromagnetic core is used, the maximum core loss which can be allowed. These limitations indicate that the toroid on the surface is not a practical transmitting antenna for extremely low frequencies or for very high powers. (a-3, b-9, c-1, d-1, e-0, f-Analysis)

5174. BRENNER, C. H., AND THIELE, G. A., "Pattern Handbook: Volumes I-VI," Ohio State University Research Foundation, Columbus, Ohio, Report Nos. 1522-11 through 1522-16, ASTIA Nos. AD463 370, AD-467 888, AD-467 893, AD-468 701, AD-470 818 and AD-470 819; 1 March 1965 to 1 August 1965. ABSTRACT: Volume (1) "Far-Field Pattern Prediction for Shipboard Antennas." Shipboard antennas operate in the vicinity of the ship's super-structure which consists of numerous metallic scatterers of various sizes and shape. The far-field patterns of shipboard antennas are perturbed by these scatterers and are therefore difficult to predict. In this report a method is discussed for approximating the far-field pattern in the horizontal plane of a thin vertical antenna (e.g., a whip antenna) near cylindrical scatterers of arbitrary cross-section whose physical heights are at least that of the antenna. The method is based on approximating the antenna with an infinite line source and the scatterer with an array of thin infinite wires. Some representative calculated and experimental results are presented which generally show very good agreement between the predicted and measured patterns. In addition, limitations of the method are discussed and the computer programs for calculating the far-field patterns are explained in some detail. Volume (2) "Memorandum on Shipboard Antenna Far-Field Pattern Prediction." Previous work on this contract produced a method for predicting the far-field pattern in the horizontal plane of a thin vertical antenna in the presence of conducting cylinders of arbitrary cross-section. However, this technique appeared to be valid only if the scatterer was taller than the antenna. This memorandum discusses an extensive set of measurements that show the influence of the scatterer to antenna height ratio on the far-field pattern, and also how the actual antenna height itself influences what this ratio should be. Thus, the limits of validity for representing finite height configurations with infinitely tall ones are now more closely defined. Volume (3) "Far-Field Patterns of a Linear Antenna Radiating in the Presence of Square Cylinders;" Volume (4) "Far-Field Patterns of a Linear Antenna Radiating in the Presence of Rectangular Cylinders;" Volume (5) "Far-Field Patterns of a Linear Antenna Radiating in the Presence of Elliptical Cylinders;" and Volume (6) "Far-Field Patterns of a Linear Antenna Radiating in the Presence of Circular Cylinders." The prediction of fields radiated by shipboard antennas is complicated by the presence of parasitically excited superstructure which warps and deteriorates the far-field patterns. If antennas are to be located in some logical manner on the ship, or if the ship design itself is to take account of the primary radiating elements, then some guides must be found to account for the influence of superstructure on antenna patterns. To this end, a handbook has been compiled, giving patterns of a thin, linear, vertical antenna radiating in the presence of cylindrical conducting structures of various cross-sectional shape. The model used to approximate this configuration is that of an infinite line source, representing the dipole, radiating in the presence of an array of thin, infinite wires parallel to each other and outlining the surface of the offending cylindrical structure. It has been shown that such a wire approximation is electrically similar to the solid metallic surface if at least 5 wires per wavelength of perimeter are used. It has also been shown that the patterns obtained from the infinitely tall model in the plane normal to the cylinder axis are good approximations to those obtained from the actual finite height configuration so long as the offending structure is taller than the source antenna, preferably twice as tall. Because long distance communication systems aboard ship usually operate at wavelengths between 10 and 100 meters, structures which have rather sizeable physical dimensions are not very large in terms of wavelength. For this reason, only offending structures up to 2 wavelengths on a side are considered. It has been found from sample calculations that patterns for objects larger than 2 wavelengths on a side do not differ radically from those for the largest objects presented in this handbook. The computer program used to calculate the patterns in this handbook is an automated version of the SCATRAN program. Certain innovations were incorporated to improve efficiency of operation. (a-1, b-3, c-1, d-1, e-989, f-Antenna patterns)

5175. ROGERS, R. L., "Automatic Tracking with Sequential Lobing," Electronic Defense Laboratories, Mountain View, California, ASTIA No. AD-626 089; 1t August 1965. ABSTRACT: This report analyzes the problem of automatic tracking with a passive RF system by sequential lobing of antenna beams. The analysis is general enough to be applied to optical, infrared, and sonar passive tracking systems. Among the problems considered are (a) processing of tracking-error waveforms, (b) demodulations techniques, (c) antenna-beam gradient and resolution, (d) pulse detection, (e) the lobing rate, and (f) receiver AGC requirements. The conclusion drawn is that the sequential-lobing system, compared to the conical-scan system, is as accurate, has the advantage of a variable lobing rate, and can change antenna beams electronically, but its signal-processing circuitry is more complex. Results of the analysis were applied to the development of wideband (50 to 500 Mc and 1 to 11 Gc) sequential-lobing tracking systems. (a-1, b-3, c-1, d-1, e-961, f-Analysis)

5176. ANONYMOUS, "A High Accuracy Microwave D.F. System," Elliott Bros., Ltd., London, England, Report No. RRL/286/P, ASTIA No. AD-360 175; 31 August 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-5, e-0, f-0)

5177. SHERRILL, W. M., AND TRAVERS, D. N., "LF to VHF Surface Ship Direction Finding Research," Southwest Research Institute, San Antonio, Texas, Contract No. NObsr-89167, Final Interim Development Report, ASTIA No. AD-471 323; 31 August 1965. ABSTRACT: Preshipboard testing of the crossed spaced loop direction finding system has shown ±6° maximum bearing error and sense performance without reversal over the 2 to 30 mc range. Other capabilities of the system include provision for rapid programmed synthesizer tuning of the Racal twin channel receiver and temporary operation of the crossed spaced loop antenna with the AN/BRD-4 D/F system in the HF range. The automatic D/F calibrator has been modified to be compatible with the twin channel and goniometer displays, as well as the AN/BRD-4 indicator. The Racal RA. 153 twin and frequency slaved RA. 117 receivers and the Intercept Research IR-3 triple channel receiver are both available for operation with the crossed spaced loop D/F system in shipboard tests. An evaluation of the recently received IR-3 receiver is in progress. Calculations have been made of the bearing error to be expected from a simple loop D/F antenna operating within two meters of a periscope. A parameter study of periscope height and distance from the D/F antenna has shown errors in excess of 20° may be expected for antenna distances less than two meters from the periscope. Final drafting and production of the AN/BRD-4 Technical Manual is in progress with completion anticipated before expiration of the current contract. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5178. EHRLICH, H., "Determination of Transmission Range of Ship Aerials," Tech. Mitt. RFZ, vol. 9, no. 3, pp. 123-128; September 1965. ABSTRACT: Observation of the required minimum ranges of ship transmitters, requires, among other things, a knowledge of the effective aerial height. Based on the measuring procedure used in the case of land equipment, the effective aerial heights of ship aerials (L and mast antenna) are experimentally determined by different methods and the results discussed. (a-3, b-2, c-4, d-4, e-0, f-Analysis)

5179. IIZUKA, K., "Experimental Study on Circular Loop Antenna Immersed Shallowly in Conducting Medium," J. Res. Nat. Bur. Stand., (Radio Science), vol. 69D, no. 9, pp. 1243-1248; September 1965. ABSTRACT: Experimental study of circular loop antenna to determine driving-point admittance. Current amplitude, phase distributions, and radiated power when immersed in dissipative medium at arbitrary orientation near plane interface; study is of significance for submarine antennas, and missile antennas. (a-3, b-1, c-1, d-1, e-0, f-Study)

5180. KAIDANOVSKIY, N. L., AND SMIRNOVA, N. A., "Resolution Limits of Radio Telescopes and Radio Interferometers Imposed by Propagation of Waves in the Space and in the Atmosphere of the Earth,"

Radio Engineering and Electronic Physics, vol. 10, no. 9, pp. 1355-1362; September 1965. ABSTRACT: The effects of propagation conditions in the atmosphere and in space on limits of resolution capabilities of antennas and interferometers are investigated. It is shown that, with certain restrictions imposed upon bandwidth and time constant, the dimensions of antennas can be practically unlimited in the region of centimeter and short decimeter wavelengths, and that the length of the interferometer base is also unlimited for wavelengths below 15 cm. For these wavelengths the limits on resolving power of antennas and interferometers are determined. (a-1, b-1, c-1, d-2, e-0, f-Propagation study)

5181. SIMMONS, B. E., BRILL, H. A., CARMICHAEL, J. J., COLLINS, W. E., AND CUMMINS, J. A., "Tactical HF Direction Finding for Amphibious Warfare," Defense Systems Laboratories, Syracuse University Research Corp., New York, Report No. DSL-R-135, Contract No. Nonr-4798-00, ASTIA No. AD-368 887; September 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5182. TRAVERS, D. N., MOORE, J. D., AND SHERRILL, W. M., "Multiloop Antenna Arrays for High-Frequency Shipboard Direction Finding," Trans. IEEE, vol. AP-13, no. 5, pp. 665-671; September 1965. ABSTRACT NO. 1: Application of multiloop arrays to HF direction finding in complex reradiation environments of shipboard sites; theoretical results show that bearing error and blurring are reduced and multivalued calibration curves are eliminated as number of loops in array is increased; coaxial spaced loop is shown to produce two to one reduction in bearing error with respect to simple loop and eliminates multivalued calibration curves for thin reradiators; direction-finding performance characteristics of coaxial spaced loop plus simple loop array are demonstrated for shipboard site. ABSTRACT NO. 2: The application of multiloop arrays to high-frequency direction finding in the complex reradiation environments of shipboard sites is analyzed in detail. Theoretical results show that the bearing error and blurring are reduced and multivalued calibration curves are eliminated as the number of loops in the array is increased. The coaxial spaced loop is shown to produce a 2 to 1 reduction in bearing error with respect to the simple loop and eliminated multivalued calibration curves for thin reradiators. The use of combination arrays such as n and (n - 1) or n and (n - 3) loops are shown to produce unambiguous direction finding patterns. The D/F performance characteristics of a coaxial spaced loop plus simple loop array are demonstrated for a shipboard site. Comparison of simple loop and three loop array calibration curves verify the performance characteristics predicted by the theory. (a_1-3, a_2-1, b-1, c-1, d-1, e-1000, f-Experimental results)

5183. TRAVERS, D. N., AND SHERRILL, W. M., "General Procedure for Computing Direction Finding Errors," Trans. IEEE, vol. AP-13, no. 5, p. 810; September 1965. ABSTRACT: Analysis for use in computing bearing errors in terms of arbitrary signals applied to display device, bearing displayed by radio direction finders is subject to errors arising from siting polarization, and other effects. (a-3, b-1, c-1, d-1, e-1000, f-Analysis)

5184. WITHERS, M. J., DAVIES, D. E. N., WRIGHT, A. H., AND APPERLEY, R. H., "Self-Focusing Receiving Array," Proc. IEE, vol. 112, no. 9, p. 1683; September 1965. ABSTRACT: The paper describes a self-focusing array which may be used for receiving signals over a wide range of incident angles and with a high aerial gain. The received signals are accompanied by a fixed-frequency pilot carrier, which is used to phase the array to receive the incoming signals. It is shown that such arrays suffer a bandwidth limitation, which takes the form of phase distortion of the signal band. Results are described for an 8-element experimental array working at 460.5 Mc/s, which will focus onto received signals over a ±60° range of angles and also focus onto transmitters placed in its own Fresnel region. (a-2, b-1, c-1, d-5, e-0, f-Description)

5185. ANONYMOUS, "Promulgation of Specific Operational Requirement EW-1.2 Light Vehicular Mounted/Team-Pack Intercept and Direction Finding System," Marine Corps., Washington, D.C., Report No. EW-1.2; 15 September 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5186. GENTRY, D. E., AND JENKINS, H. H., "Error Reduction in Loop Direction Finders," Georgia Institute of Technology, Engineering Experiment Station, Atlanta, Georgia, Quarterly Report No. 2, Contract No. DA 28-043-AMC-01207(E), ASTIA No. AD-473 847; 15 September 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-See Abstract No. 5144)

5187. ANONYMOUS, "Direction Finding Techniques in VHF-UHF," Goodyear Aerospace Corporation, Litchfield Park, Arizona, Interim Engineering Report No. 4, Contract No. AF 33(615)1942, ASTIA No. AD-365 950; 17 September 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5188. DEHART, W. E., HUGGETT, W. K., LEE, R. E., RICHARDSON, W., AND TAFT, E., "Investigation of a Hyperbolic Position-Locating Assembly," Michigan University, Radio Science Laboratory, Ann Arbor, Michigan, Quarterly Progress Report No. 4, Contract No. DA 28-043-AMC-00295(E), ASTIA No. AD-366 254, October 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5189. DETERT, D. G., "An Investigation of Large-Scale Ionospheric Disturbances Observed in a Radiolocation Experiment," University of Illinois Radiolocation Research Laboratory, Urbana, Illinois, Technical Report No. 28, Contract No. Nonr-1934-02, ASTIA No. AD-623 580; October 1965. ABSTRACT: Measurements of the azimuthal and vertical angles of arrival were made during the afternoon and early evening on pulse transmissions at 5 mcs over a 452 km east to west path using a six-element interferometer antenna system. The large systematic variations appearing in rapid time series measurements are shown to be due to the passage of large-scale traveling ionospheric disturbances through the transmission path. A model is proposed for these perturbations, consisting of a long front whose cross section is elliptically elongated in the horizontal direction and whose interior contains an increase or decrease of electron density over the background profile values. The angle of arrival variations which should be characteristic of the passage of such irregularities are developed. The variations are seen to be dependent on the direction of travel of the disturbances, and data samples showing each of the several characteristic variations are presented. Vertical incidence swept-frequency ionospheric soundings taken at one minute intervals at both the midpoint and receiving endpoint of the path are used to confirm the identification of the particular disturbance for each of these samples. (a-1, b-3, c-1, d-1, e-896, f-Study and investigation)

5190. IBUKUN, O., "On the Predictions of Atmospheric Radio Noise Levels in the Tropics," J. atmos. terrest. Phys., vol. 27, no. 10, pp. 1059-1080; October 1965. ABSTRACT: The prediction curves show expected median, upper decile and lower decile levels of atmospheric radio noise power for all frequencies from 10 kc/s to 30 Mc/s, during 4-hour time blocks of the day for each season of the year. Even though there has been an increase in the number of places where these predictions have been based on actual measurements, unfortunately there have been only few in tropical areas which are known to be major sources of atmospheric radio noise. Measurements of atmospheric noise levels have therefore been made at Ibadan, Nigeria (7°N, 4°E) in a tropical area, between 1958 and 1962. These measured values have been compared with corresponding values interpolated for Ibadan from the C.C.I.R. prediction curves. It is found that, in general, the predicted and measured values are in good agreement but the discrepancies at certain times and frequencies have been assessed and reasons for the disagreements discussed. The adoption of the C.C.I.R. 4-hourly divisions of the day for the prediction of atmospheric noise levels and compilation of noise data is re-examined in the light of available information in a tropical area where local storms are prevalent for most parts of the year. The division is found unsatisfactory at least for certain parts of the day and a division of the day into eight periods i.e., 0000-0400, 0400-0600, 0600-0800, 0800-1200, 1200-1400, 1400-1600, 1600-2000, 2000-2400 hours is suggested, together with the advisability of merging the two night periods 2000-2400 and 0000-0400 hours into one noise period in tropical areas where the compilation of noise records usually presents some difficulty. (a-3, b-1, c-1, d-5, e-0, f-Noise study)

5191. JONES, T. B., AND WAND, I. C., "Doppler Studies of Complex Reflections Produced by Travelling Ionospheric Disturbances," J. atmos. terrest. phys., vol. 27, no. 10, p. 1111; October 1965. ABSTRACT: Continuous recording of the frequency of the 5 Mc/s C.W. transmission M.S.F. Rugby, has enabled the effects produced by travelling disturbances on the phase height of the reflection levels of both magneto-ionic components to be evaluated. It has been possible to determine the velocity of some of the disturbances and to resolve complex phenomena such as multiple splitting without recourse to pulse methods. (a-1, b-1, c-1, d-5, e-0, f-Experimental study)

5192. LUSTIG, J., "Vector Amplitude and Phase Measuring Devices," New York University, School of Engineering and Science, Research Division, SETE Project Report 210/88, ASTIA No. AD-624 234;

October 1965. ABSTRACT: Vectors are quantities possessing both magnitude and direction as distinguished from scalar values which have magnitude only. Typical vectors are displacement, velocity and acceleration of a particle whereas the mass, temperature and density are scalar values. A vector is often indicated graphically by means of an arrow, the length of the arrow is proportional to the scalar magnitude of the vector and the direction in which the arrow points is the direction of the vector. The tail or initial point of the arrow is it's origin the head or final point is it's terminus. In electronics, vector magnitudes are defined in terms of amplitudes and vector directions in terms of angles. Both electrical and physical phase angles exist. Vectors can be used to measure many electronic circuits. For example, they can be used to analyze oscillator circuits by plotting the voltage and current vectors of the oscillator. In phase shifter RL and RC circuits, vectors can be used to explain the phase relationships of current and voltage. Discriminator circuits can be described by plotting the diode voltage vectors at various frequencies, phase angle voltmeters are used to indicate the amplitude and phase angle of a voltage m surement and instruments needed to evaluate servo systems can be classified as vector analyzing, measuring or testing units. In this report we will consider any device which is capable of measuring or supplying the amplitude and phase angle of a signal as a vector instrument. Thus we find that phase voltmeters, antenna pattern recorders, servo analyzers and some transfer function analyzers can rightfully be included in the vector measuring instrumentation category. The bulk of the units listed are operated manually, and the data has to be retrieved by the operator. A search of available information disclosed a small number of autometer vector measuring systems. Some of these systems can be found in the SETE publication No. 210/84, Microwave Measurements of Admittance, Impedance and Transfer Function Parameters and several others appear in a recent publication SETE No. 205/37, Search for Test Sets for Moving Target Indicators. However, a number of articles have been published which bear directly on the subject of vector plotting and some of these papers describe automatic systems. These articles will be discussed, and in some instances reproduced in toto in the section following this introduction. Except for antennas, all of the equipments discussed are intended to measure electrical vectors having phase angles which are defined in terms of electrical degrees, and which represent the phase relationship of a voltage or current flowing within a circuit. Measurements upon electro-magnetic waves being propagated in space involve knowledge of a more complex set of vector relationships to completely determine the wave structure. Both geometrical and electrical angles are involved, and the electrical angles may involve both physical and electrical phase angles. The antenna pattern recorders listed herein represent a sampling of devices which are useful in measuring the variation of response (of an antenna) with respect to rotation about one or more controlled axes. Other, military nomenclatured antenna test equipments are listed in SETE 210/70. A complete report on antenna measurement techniques and equipment is scheduled for preparation in due course. The papers in this report were selected to illustrate the scope of different applications of the same principle. The arrangement is arbitrary and not intended to convey superiority of technique in the various disciplines cited. (a-1, b-3, c-1, d-1, e-873, f-Principles)

5193 MOORE, J D., CASTLES, M. P., AND TRAVERS, D N., "Improved Spaced Loop Direction Finder Antenna (20 - 150 mc)," Southwest Research Institute, San Antonio, Texas, Contract No. DA 28-043-AMC-01633(E), Quarterly Report No. 1; October 1965. ABSTRACT: Coaxial spaced loop theory is reviewed and initial work under this program is outlined. This includes study of the problems encountered with the single antenna approach used under the previous program. Problems of a single spaced loop antenna for the 20- to 150-mc frequency range were: (1) engineering limitations in the design of the first antenna and (2) resonances of the antenna. A workable solution to the engineering limitations of the first model below 70 mc is described, and it is shown that the three-antenna approach of this program will avoid resonances and eliminate the second problem area. Balanced gap spaced loop antennas have been constructed in three sizes for the low-range, mid-range, and high-range antenna heads. Tests of the first model of the low-range antenna indicated a need to improve construction methods for operation above 40 mc. A revision in the technique of constructing the low range spaced loop antenna has yielded excellent performance to 55 mc for all signal polarizations. Further improvement is anticipated. Field tests of the mid-range and low-range antennas are briefly reported but were not complete at the time of this writing. Excellent sense patterns have been obtained from the low-range balanced gap spaced loop by utilizing a resistor across each of the two gaps on either of the balanced gap loops. The development of field effect transistor preamplifiers has received emphasis. Tests indicate that a balanced source follower using type 2N3823 field effect transistors will equal or surpass the balanced cathode follower circuitry with a significant reduction in power requirements. Improved varactor diodes with "Q's" approximately 2.5 times the value of those used in the previous experimental antenna have been procured and have been tested. Broadband preamplifiers to follow the first amplifier in the antenna are being designed and optimized for each antenna. Antenna control circuitry redesign now permits a reduction in the number of control leads to nine or ten. Improvement in the sense technique by incorporating deflection plate switching to simplify pattern interpretation is being investigated. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

5194. ROSENBAUM, A. S., "Characteristics of the Monopulse Mode Display for the Wullenweber Radio Direction Finding System," University of Illinois, Radiolocation Research Laboratory, Urbana, Illinois, Contract No. NObsr-89229, Technical Report No. 16, RRL 291, ASTIA No. AD-624 166; October 1965. ABSTRACT: This paper is concerned with the display system characteristics of a monopulse radio direction finding system employing the Wullenweber antenna array. The monopulse display is ideally suited to many areas of wave propagation research. Its capability for time resolution of multipath signals makes the system a highly desirable tool for ionospheric propagation research. For example, the monopulse display was successfully used to analyze ionospheric mode splitting, and was able to resolve the two arrival directions completely. In the past, such investigations as this were of necessity experimental in nature. For instance, a direction finding system could only be tested under a limited set of available signal conditions. From this fairly sketchy data, no clear-cut picture of the direction finder's operation could be obtained, at least quantitatively. With the advent of the digital computer, however, simulation techniques become practical and even highly desirable. This method affords an efficient means to amass the amount of data necessary to describe such a system. (a-1, b-3, c-1, d-1, e-0, f-Analysis and evaluation)

5195. TORREY, R. A., AND ROBINSON, G. G., "An Electronic Means of Providing Binaural Indication of the Direction of Radio Transmissions," NASA TN-D-3062, Washington, D.C.; October 1965. ABSTRACT: The use of two hearing characteristics, by which humans normally detect the point of origin of a sound, is investigated as a means for detecting the point of origin of a radio signal. Provision was made to rearrange the audio output of a radio communication receiver in such a manner that the user, by listening to a pair of earphones, could determine the direction from which the transmission was coming. This device has potential application in providing orientation information to members of a space ship crew, or members of lunar exploration parties. A simulator with low power and lightweight equipment was developed to provide transmitter localization over short ranges. (a-1, b-3, c-1, d-1, e-0, f-Description)

5196. MARTIN, P. E., AND TRAVERS, D. N., "A Transponder for Tracking and Physiological Monitoring of Free Animals," Southwest Research Institute, San Antonio, Texas, Technical Note; 1 October 1965. ABSTRACT: A miniature HF transponder D/F system to provide, upon interrogation, both azimuth and distance measurements between a single monitoring station and a transponder mounted on an unrestrained animal. (a-1, b-3, c-1, d-1, e-1000, f-Biotelemetry)

5197. BECKER, C. J., ET AL., "Optimum Array Gain for Directional Noise," U.S Navy Underwater Sound Laboratory, Fort Turnbull, New London, Connecticut, ASTIA No. AD-623 36?; 5 October 1965. ABSTRACT: From the definition of array gain, the gain of a linear array of point receivers is given in terms of spatial correlation of the noise. The theoretical methods of obtaining spatial correlation for directional noise are reviewed. An experimental verification of the theory is also presented. Under consideration is an 8-element vertical array of equispaced elements perpendicular to the surface of the ocean. The gain is computed for the cases of a single frequency and of narrow-band and wide-band frequencies. The effects of both broadside and endfire steering are analyzed. The gain is computed as a function of the spacing between elements for the case of uniform shading. For each configuration, the gain for optimum shading is obtained. For the case of isotropic noise and narrow-band frequency, the gain is on the order of 10 log 8, or about 9 db. For the case of directional noise, narrow-band frequency (750-850 cps), broadside steering, and uniform shading, the gain is on the order of 17 db for optimum spacing. An additional 2 db is obtained for the case of optimum shading at the optimum spacing configuration. (a-1, b-3, c-1, d-1, e-960, f-Experimental analysis)

5198. ANONYMOUS, "First ADF to Meet Airline Specification," Engineering, vol. 200, no. 5190, p. 457; 8 October 1965. ABSTRACT: Marconi Co. Ltd. have produced type AD370 automatic direction finder, to conform with latest airline specification, Arinc 550; equipment is said to provide pilots with fastest possible means of finding bearing of any given radio station; there are no moving parts at all in tuning and range selection stages. (a-3, b-2, c-1, d-5, e-0, f-Description)

5199. BAILEY, A. D., AND DYSON, J. D., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range: Part I," University of Illinois, The Radiolocation Research Laboratory, Urbana, Illinois, Final Report-Part 1, ASTIA No. AD-475 184; November 1965. ABSTRACT: The purpose of the contract was to continue and extend the studies and investigations leading to the design of radio direction finding systems (and radiolocation systems) for the MF-HF-VHF range in accordance with specified requirements. The work was done under two tasks entitled: radio direction finder and radiolocation systems engineering, and directional radio propagation and radiolocation research. Progress was made under each Task. Under the first Task a circularly symmetric six-element large, plane, shielded-loop array has been constructed for use on steeply downcoming signals in the HF range. The final results of the study on the nesting of sets of circularly symmetric arrays are given. A novel VHF directional array consisting of resonant loop elements in a log-periodic array is described. The second Task is the subject of two thesis investigations and the status of each of these is given. (a-1, b-3, c-1, d-1, e-871, f-See Abstract No. 5015)

5200. BANTA, E. D., STEINBERG, B. D., THOMSON, D. N., AND URKOWITZ, H., "Airborne Phased Array Antenna Signal Processing Techniques," General Atronics Corporation, Philadelphia, Pennsylvania, Interim Engineering Report No. 1, Contract No. AF 33(615)2592, ASTIA No. AD-473 613; November 1965. ABSTRACT: A self-phasing technique for an airborne antenna array is being investigated. The purpose of the self-phasing array is to provide, in all direction from the aircraft, an angular resolution comparable to that which would be obtained from a perfect array whose size is as large as the largest airplane dimension transverse to the direction being examined, without the necessity for knowing the precise location of the receiving elements and with immunity to the motion of the aircraft structure itself. The problems which were investigated in this interval are: obtaining a smooth reference for the phasing loops, estimating the errors of the antenna gain pattern and sidelobe level due to irregular and random location and random phase errors, the problems caused by an extended reflecting object such as an illuminated ground patch whose azimuthal extent is so large as to produce a lobular pattern across the extended array. (a-1, b-3, c-1, d-1, e-0, f-Progress report)

5201. BURT, A. W., KAPLAN, D. J., KEENLY, R. R., REEVES, J. F., AND SHAFFER, F. B., "Mathematical Considerations Pertaining to the Accuracy of Position Location and Navigation Systems," Stanford Research Institute, Menlo Park, California, Contract No. Nonr-2332(00), Report No. NWRC-RM 34, ASTIA No. AD-629 609; November 1965. ABSTRACT: The general case of the location of a point at the intersection of two lines-of-position involves different errors associated with each line. Also the general angle of intersection is other than 90 degrees. The distribution of error about such a point is an ellipse. A method of analysis has been developed to convert this general case to the more readily handled case of two different standard deviations along the major and minor axes of the error ellipse. Nomograms and graphs are given to facilitate computation of error probabilities. Curves are shown to indicate the geometrical magnification of error as the intersection angle departs from 90 degrees. In addition the development is shown of a total error ellipse resulting from the combination from several randomly oriented error ellipses representing error components. Numerical examples are given. Derivations of all formulas shown are given in the appendixes. (a-1, b-3, c-1, d-1, e-984, f-Mathematical analysis)

5202. BURTNYK, N., MCLEISH, C. W., AND WOLFE, J., "Performance of an Interferometer Direction Finder for the H.F. Band," Proc. IEE., vol. 112, no. 11, pp. 2055-2059; November 1965. ABSTRACT: An hf direction finder consisting of two orthogonal simple interferometers was built and tested by making over 16000 direction-of-arrival measurements. This paper describes the performance of the system, giving ambiguity-resolution figures and bearing-accuracy results. An error-reduction factor of about 4 times was obtained over narrow-aperture systems operating in similar wave-interference fields. This paper presents an experimental evaluation of a radio direction finder which uses the simple interferometer principle. Since we are concerned with the measurement of direction of arrival of long-distance ionospherically reflected transmissions, the performance is dependent to a great extent on the test environment. A fairly representative range of transmitter frequencies and distances can easily be obtained, but a satisfactory sample of ionospheric conditions requires much more testing time than is usually available. (a-1, b-2, c-1, d-5, e-863, f-Experimental evaluation)

5203. CARRU, H., GENDRIN, R., AND REYSSAT, M., "The Ionospheric Refraction for Frequencies of 20, 40 and 108 Mc/s, and Its Application to the Doppler Effect of Satellites," Redstone Scientific Information Center, Redstone Arsenal, Alabama, ASTIA No. AD-475 667; November 1965. ABSTRACT: Study and calculation of the paths of radio waves through a simplified ionosphere. The ionospheric refraction is deduced as function of the altitude and for a great range of zenith distances, further derived are equations for the angular shift, the optical path length, and the true Doppler effect. (a-1, b-3, c-1, d-1, e-0, f-Translation)

5204. DAVIES, D. E. N., "A Transformation between the Phasing Techniques Required for Linear and Circular Aerial Arrays," Proc. IEE, vol. 112, no. 11, p. 2041; November 1965. ABSTRACT NO. 1: The paper describes a method for producing an angular deflection, or continuous rotation, of any directional pattern formed from a circular (or cylindrical) array, by means of a simple linear progressive phase shift across the input ports of a multiple-port matrix network, whose output ports feed the array elements. If the progressive phase shift has a value of ϕ radians between adjacent ports, the directional pattern is rotated through an angle of ϕ radians. The principal advantage of the technique is that it enables any aperture distribution of a circular array to be electronically rotated by the simple phasing techniques normally associated with a linear array. It is also shown that the matrix network may take the form of a Butler-type matrix, which may be easily realised using only hybrid networks and phase shifters. ABSTRACT NO. 2: Circular or cylindrical aerial arrays appear to possess the attractive feature of being able to produce a narrow directional beam, which can be electronically rotated without change of beam shape, by means of either switching or phase-shifting of the signals associated with each aerial element. Despite this apparent advantage, little use appears to have been made of such arrays. Experimental arrays with switching or electronic phase-shifting have been constructed, but operational use of such arrays appears to have been mainly restricted to direction-finding applications, in which only a small arc of the circle is used at any one time. The Wullenweber array is one such example using a small arc of a circle, but in principle this might more accurately be considered as a bent linear array, with appropriate phasing used to compensate for the physical deformation. One disadvantage of circular arrays is that, once the directional pattern in the plane of the circle has been fixed, the pattern in planes normal to the circle can only be altered to a limited extent by controlling the directional patterns of the aerial elements. This, however, is not an overwhelming disadvantage, and it appears that several of the problems preventing further exploitation of these arrays are associated with problems of array-phasing techniques and pattern-synthesis procedures. There are two principal reasons why circular aerial arrays have not received much attention for possible applications to communications, direction-finding or radar. These are: (a) Until quite recently, very little work has been done on methods for synthetising attractive directional patterns, involving narrow beams and low side lobes, from circular arrays. In fact, simple synthesis techniques are still not available. (b) In order to utilise the symmetry of such arrays, it would clearly be useful if the directional pattern could be electronically rotated. Methods have been proposed for achieving such effects, but the methods concerned are, in general, far more complicated than the simple phasing required to electronically deflect the pattern of a linear array. Not only are the phasing techniques for circular arrays more complicated, but, in addition, the use of amplitude tapers on such arrays involves considerable further complication, since these also must be electronically rotated with the directional pattern. This paper describes circuits for feeding a circular array which enable the beam to be electrically rotated by the use of the simple phasing techniques normally associated with linear arrays. (a_1-2, a_2-2, b-1, c-1, d-5, e-865, f-Description)

5205. DONNELLY, R. F., DETERT, D. G., AND BAILEY, A. D., "A Study of High-Frequency Directional Propagation Over a 450 Kilometer East to West Path," University of Illinois, Radiolocation Research Laboratory, Urbana, Illinois, RRL No. 254, ASTIA No. AD-625 413; November 1965. ABSTRACT: The Columbus Experiment was a relative short range HF radiolocation experiment in which measurements were made of the azimuthal and vertical incidence angles of arrival and the relative time delay of pulse transmissions from Columbus, Ohio (450 km range due east of Urbana). All observations were taken during late afternoon hours and continuing until the propagation path failed. The angle of arrival measurements were made employing a six-element interferometer system in a configuration of three two-element interferometer pairs. Vertical incidence ionosondes were operated at the mid-point and the receiving end of the path. The basic measurements of azimuthal and vertical incidence angles of arrival were taken on 126 days during the period of the Columbus Experiment. The measurements are presented point by point, approximately two hours on each graph, with both the time and angle scales being identical throughout to facilitate comparisons. It should be emphasized that no averaging of any sort is present in this data, and that each point represents one specific measurement of azimuth or vertical incidence angle. (a-1, b-3, c-1, d-1, e-932, f-Experimental results)

5206. METCALF, W. S., "Characteristic Impedance of Rectangular Transmission Lines," Proc. IEE, vol. 112, no. 11, p. 2033; November 1965. ABSTRACT: The paper describes an approximate method, involving a relaxation technique, for the solution of Laplace's equation in two dimensions, and this approach is used to derive the characteristic impedance of rectangular transmission lines on a high-speed digital computer (Titan). A set of design curves is given. It has often been found mechanically expedient to use high-frequency transmission lines of rectangular cross-section. The electrical characteristics of such a system have had considerable attention in recent literature. Two papers provide the possibility of obtaining limited design details. Green considers the case of a square inner and square outer and provides a good design Table: the square section was originally treated by Gandy and Southwell by the same method as Green, but for only one ratio of inner and outer conductors. Guckel and Bates fully evaluate the shielded-slab line, i.e. with rectangular outer of infinite width. In this paper the general rectangular section is investigated, and design curves are given which have an accuracy, before plotting, of better than 0.5%. An accuracy of this order is all that is required for any practical design that has been encountered by the author. (a-1, b-1, c-1, d-5, e-0, f-Description)

5207. ORENTAS, A. A., AND DYSON, J. D., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range. Part II. A Study of Nested Antenna Arrays for a Circularly Symmetric Interferometer Direction Finding System," University of Illinois, Urbana Illinois, Radiolocation Research Laboratories, Final Report, RRL Report No. 277-Pt. II-21, Contract No. DA 28-043-AMC-01351, ASTIA No. AD-475 816; November 1965. ABSTRACT: Not available. (a-3, b-1, c-1, d-1, c-871, f-See Abstract No. 5199)

5208. RYAZANTSEV, A. M., AND SHABEL'NIKOV, A. V., "Propagation of Radio Waves Through the Earth's Crust (A Review)," Radio Eng. and Electron. Phys., vol. 10, no. 11, p. 1643; November 1965. ABSTRACT: The article is devoted to a review of theoretical and experimental papers which contain data on physical and electrical properties of the earth's crust and on their relationship to temperature, pressure and humidity. Reviewed are methods for computation of fields in an absorbing medium whose electrical properties are either invariant with time and space or vary with space in one given direction. In recent times various investigators have demonstrated an increased interest in the problem of propagation of radio waves through the earth's crust. This problem is encountered in design of underground radio communication systems, in development of apparatus for detection of minerals by radio waves, in construction of highly effective ground and underwater antennas, and in other such situations. The complexity of solution of this problem is due to the fact that the crust of the earth is an inhomogenous medium whose conductivity, dielectric constant and magnetic permeability vary in both horizontal and vertical directions. Consequently, the mode of underground propagation of radio waves, the methods for computation of the field and the magnitude of the signal at the receiving point will depend upon the properties of the medium and upon its spatial variations. On the other hand, however, the propagation of radio waves through the earth is to a certain extent significantly simpler than the propagation of radio waves through the atmosphere of the earth because the electrical parameters of the earth's crust are practically invariant with time. Therefore, in underground propagation of radio waves there are no time fluctuations of the received signal. This article gives a review of theoretical and experimental papers which contain data on electrical characteristics of the earth's crust, the methods for computation of field in an absorbing medium with different variations of dielectric constant ϵ and resistivity ρ of the earth, of the earth, as well as some examples of performance of practical underground radio communication systems. (a-1, b-2, c-1, d-2, e-0, f-Review of propagation studies)

5209. SEMENOV, B. I., "Scattering of Electromagnetic Waves by Bounded Regions of Rough Surfaces Having Finite Conductivity," Radio Eng. and Electron. Phys., vol. 10, no. 11, p. 1666; November 1965. ABSTRACT: The solution to the problem of scattering of electromagnetic waves by a bounded portion of a rough surface having finite conductivity is obtained in the Kirchhoff approximation. Both two-dimensional and one-dimensional roughness is considered. The stationary phase method is used for calculating the integrals. The results of calculations of the intensity of the scattered electromagnetic waves for the cases of a perfect conductor and a perfect dielectric (having $\epsilon = 4$) are presented. (a-1, b-1, c-1, d-2, e-0, f-Theory)

5210. SHARE, I., "Wave Propagation in Plasma," Electro-Technology, vol. 76, no. 5, pp. 61-72; November 1965. ABSTRACT: The term plasma refers to a medium in which the density of negatively charged particles is equal to the density of positively charged particles; therefore, the net charge density is zero. The plasmas considered in this article are made up of negatively charged electrons, singly charged positive ions (all with the same mass), and neutral (un-ionised) particles. Complications such as ionising collisions and the recombination of electrons and ions will be ignored. The subject of this article is the propagation of an electromagnetic wave in an infinite, uniform plasma medium. We will first consider wave propagation in the absence of a magnetic field. Later, we will consider the more general and more complicated case where the wave passes through a uniform, nonvarying magnetic field. (a-1, b-2, c-1, d-1, e-0, f-Propagation study)

5211. WEDEPOHL, L. M., AND WASLEY, R. G., "Wave Propagation in Polyphase Transmission Systems," Proc. IEE, vol. 112, no. 11, p. 2113; November 1965. ABSTRACT: In the past it has been customary to assume that earth wires in a transmission system have zero potential along their entire length. In the paper attention is drawn to the fact that this assumption is valid only if the electrical length of the spacing between towers is less than one quarter wavelength. A generalised theory is developed for the case of earth wires which are bonded to earth only at the towers and are treated as conductors between towers. The method is an extension of the theory of natural modes previously given, in which it is shown that a modified concept of natural modes satisfactorily explains the present case. A suitable procedure for digital computation is described, which draws special attention to problems different from those described previously. The results of numerical computation are presented in which it is shown that the discretely bonded earth wires act like selective filters. This is manifested by rapid changes in attenuation, impedance and modal vector distributions in the vicinity of frequencies, which make the electrical length between towers even multiples of one half wavelength. The paper concludes by considering further problems still outstanding in developing a complete theory of multiconductor systems. (a-1, b-1, c-1, d-5, e-0, f-Propagation study)

5212. WHEELER, W. R., "Research on New Types of Antenna Systems for the Frequency Range 30-100 Mc," Denver Research Institute, Denver, Colorado, ASTIA No. AD-624 478; 5 November 1965. ABSTRACT: This Research Report presents the results of tests made on an AS-578/ARA-25 antenna. This antenna is part of an AN/ARA-25 direction finding system. The antenna and the direction finding system are analyzed and found to be adequate. The antenna itself does have low gain, but possible higher gain antennas are too large. A system for reducing the effect of near metal objects is presented. Appendix A is a theoretical development of the pattern function for this type of antenna. (a-1, b-3, c-1, d-1, e-0, f-Tests and evaluation)

5213. GRUBB, W. C., "Radio Direction Finder," Grubb, W. C., Wickatunk, New Jersey, Patent No. 3,217,327, Filed June 1963; patented 9 November 1965. ABSTRACT: This invention relates generally to a radio direction finder and more particularly to direction finding equipment for tracking moving radio frequency transmitters. In the usual direction finding equipment the phase differential between two signals is used as a means of sensing the relative off-target axial position of the receiver antenna. Owing to the difference in transit time between the wave fronts off boresight, a phase difference has been shown to exist, proportional to the fractional wavelength separation between two antenna elements. A large physical discontinuity or reflecting surface present in the side lobes of the antenna pattern will cause a lack of symmetry in the antenna reception pattern, since reflected components traveling over a longer path arrive at the antenna at a later time than direct waves. Hence, the reflected components lag the direct wave and cause the position at which a symmetry of phase balance, or a minimum of phase difference should occur to deviate from the location it would be in without the reflecting surface being present. It is seen that to have some means of rejecting off phase components from the antenna would serve as a means of maintaining the original position of symmetry in the presence of a reflecting object within a side lobe, since inphase components would not cause an error. A signal from a moving transmitter is subject to the well known Doppler effect as well as variations in strength of the received signal caused by multi-path reflections, some enhancing, some subtracting from the signal level induced in the receiver antenna. It is therefore an object of this invention to eliminate the effects of phase differences between received signals in a radio direction finder. It is a further object of this invention to provide a radio direction finder that is insensitive to reflected signals. A still further object of this invention is to provide an improved radio direction finder capable of accurately tracking a moving radio frequency transmitter. (a-5, b-8, c-1, d-1, e-0, f-Patent notice)

5214. BAILEY, J. C., "Technical and Operational Evaluation of the Cook Recovery Adapter, Model 3592," Naval Air Test Center, Patuxent River, Maryland, Final Report No. 1, Report No. WST-129R-65, ASTIA No. AD-475 758; 29 November 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-Evaluation)

5215. ANONYMOUS, "A Solid State A. D. F.," Electronic Engineering, vol. 37, no. 454, p. 811; December 1965. ABSTRACT: The first airborne automatic direction finder in the world which conforms fully with the latest airline specification, (ARINC 550) and also provides completely automatic, solid state, crystal controlled tuning, has been developed by The Marconi Co. Ltd. This new equipment, type AD370, provides pilots with the fastest possible means of finding the bearing of any given radio station. The price is competitive with current American automatic direction finders, and the equipment will fit directly into all the latest American aircraft types, and also into the BAC 111. Its small size, light weight and ease of operation, also make it suitable for use in all types of military and civil aircraft, including helicopters and high performance fighters. The new equipment is completely transistorized, and there are no moving parts in either the tuning stages or the range selection. It is believed to be the only adf available in the world in which mechanical switching and variable capacitors have been completely eliminated. For this reason alone, the AD370 should prove in service to be more reliable than any other automatic direction finder which is currently available. The accuracy and stability of the frequency selection is ensured by only 13 crystals, and the need for fine tuning is completely eliminated. There is, in fact, no provision on the control unit for frequency trimming. In operation, the required frequency is set up on the control unit, using easily read decade dials. Tuning is then performed automatically and instantaneously by the solid state electronic system. In this way, the bearing of the selected station is provided easily, quickly and reliably. The AD370 is a completely solid state equipment. Varactor diodes are used in the tuning of the IF and rf stages, and semiconductor diodes provide all range and crystal switching functions. Moving parts have been completely eliminated from the receiver, with the exception of the goniometer and servo motor, which replace the rotating loop aerial in earlier direction finders, and which cannot be eliminated in a practical adf. The associated synchro transmitter has also been retained to transmit the bearing information to the pilot's indicator. Two relays, used to switch the aerials when the equipment is not being used for automatic direction finding, are the only other moving parts in the receiver. The circuits are contained in a short 1/4 ATR case, with a 'dog-house' on the front panel, containing the goniometer, servo motor, synchro transmitter and associated circuits. Circuit components are mounted on tag boards, which are screwed to both sides of a central partition running the length of the receiver unit. Internal plugs and sockets have been eliminated, and direct soldered connexions are used to interconnect the tag boards. This design gives easy access to all components and enables interconnexions to be kept to a minimum. The tuning system employs three mixers, with crystal oscillators inputs, which convert the rf signals to an intermediate frequency in the band 130.5 to 180 kc/s. The IF unit is tuned accurately over this narrow band by varactor diodes. With this system, all the advantages of crystal control are obtained using only 13 crystals, instead of the usual complement of 36. A feature of the AD370 is the use of three separate detectors, for servo amplifier, audio amplifier, and agc circuits. This permits the use of a beat frequency oscillator, without affecting the adf performance The decade frequency selector on the control unit, also conforms fully with ARINC Characteristic 550. The selected frequency is displayed in clear numerals 1/4 in. high, and integral panel lighting is provided. The frequency controls select resistance networks which provide the voltages to control the varactor diodes in the rf and IF tuning stages. The operating frequency is selected on an easily read decade dial, using three selector controls - for hundreds, tens and units and halves of kilocycles per second. The frequency scale is continuous from 190 to 1,799.5 kc/s, in steps of 0.5 kc/s. In normal adf operation, the bearing of the selected station will be shown immediately on the bearing indicator. Alternatively, direction finding can be accomplished manually, with the function switch turned to the loop position. The sense aerial is then disconnected, and the search coil of the goniometer may be rotated by means of a switch on the controller. The null position is determined by listening to the audio output of the receiver. This facility is normally only used in conditions of abnormal static. The loop rotating switch may be used, however, in normal operation, to move the bearing indicator from the indicated reading, to check that it returns to the same position when the loop switch is released. This confirms the operation of the automatic direction finder. (a-2, b-1, c-1, d-5, e-0, f-Description)

5216. BAILEY, A. D., DYSON, J. D., AND ERNST, E. W., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Radiolocation Research Laboratory, Engineering Experiment Station, Urbana, Illinois, Report No. 22, RRL No. 281 under Contract for U.S. Army Electronics Command, Fort Monmouth, New Jersey, Technical Report EC OM-01333(E), ASTIA No. AD-476 486; December 1965. ABSTRACT: This is the first of series of quarterly reports under subject contract. It is too early to draw many significant conclusions concerning the studies being made. There are, however, several interesting investigations underway and quantitative results have been obtained. The problems associated with exact matching of the phase and gain characteristics of two or more radio receivers have been circumvented in two ways: one may use a solid-state type of rapid channel-interchange switching or one may use a digital computer which is programmed to adapt to the differential mismatch and make automatic corrections. Progress in the application of each method is given. An RDF system using loop antennas has been instrumented for a study of the direction of arrival of signal modes arriving from short ranges at high elevation angles. Proposals for alternate systems have been made and one of them is being pursued; it is concerned with a Cross-Array geometry. Studies of a log periodic T-array for use at VHF are being made and some of the early results are given. The results of two theses in the area of radiolocation are given. The thesis on simple models of the ionosphere amplifies the observation that there is no satisfactory substitute for an adequate ray-trace. The thesis on irregularities points out some of the measurement problems that remain to be done. The expressed purpose of this contract is to conduct studies and investigations directed toward the design of a Direction Finder System for the MF-HF-VHF Ranges in accordance with Electronics Command Confidential Technical Requirements No. SCL-8051 dated 28 September 1964 entitled "MF-HF-VHF DF System Study." It is a continuation and extension of previous work along similar guide lines but in the sense of additional, new and/or more detailed efforts which hav been indicated as necessary from the results of the prior studies. Two research investigations that were begun under contract AMC-01351(E) have now been completed. The investigation of simple ionospheric models and analytical methods for short range radiolocation is contained in Appendix B. An abstract of the investigation of large-scale traveling ionospheric disturbances observed in a radiolocation experiment is reported under Task II. Certain other studies which were begun under contract AMC-01351(E) are being continued. The plan for continuation and extension of the work proposed under subject contract is organized under two broad continuing tasks. These are Task I - Radio Direction Finder and Radiolocation Systems Engineering, and Task II - Directional Radio Propagation and Radiolocation Research. (a-1, b-3, c-1, d-1, e-871, f-Study report. See Abstract No. 5207)

5217. JONES, E. C., "A Digital Simulation of the Wullenweber Direction Finding System," University of Illinois, Urbana, Illinois, ASTIA No. AD-626 324; December 1965. ABSTRACT: The purpose of this report is to describe the development of a digital model for simulation of the University of Illinois Wullenweber direction finding system when operating in the scanning mode. Such a study has been motivated by two considerations. The first is the desire to study the accuracy and sensitivity problems in the present system, and to explore questions of performance degradation when certain engineering specifications are relaxed. The second is to have at the disposal of the Radiolocation Research Laboratory a "tool" which might be used to study ideas for future system development and improvement. Such studies would logically precede the construction of any new systems, or extensive modifications of the present system. Actual uses of the resulting digital simulation model will be subjects for later reports and/or notes. (a-1, b-3, c-1, d-1, e-962, f-Study report)

5218. SENGUPTA, D. L., FERRIS, J. E., LARSON, R. W., AND SMITH, T. M., "Azimuth and Elevation Direction Finder Study," Michigan University, Ann Arbor, Michigan, Radiation Laboratory, Quarterly Report No. 1, Contract DA 28-043-AMC-01499, ASTIA No. AD-479 635; December 1965. ABSTRACT: Not available. (a-4, b-3, c-1, d-1, e-0, f-0)

5219. SESHADRI, S. R., AND TUAN, H. S., "Radiation Resistance of Circular Current Filament in Magnetoionic Medium," Proc. IEE, vol. 112, no. 12, pp. 2192-2198; December 1965. ABSTRACT: Radiation from circular filament of electric current immersed in unbounded, loss-free magnetoionic medium for case in which axis of loop is oriented parallel to direction of magnetostatic field; integral expression for radiation resistance of current loop is obtained for constant current distribution around loop; radiation resistance is found to be finite for all frequencies except upper hybrid resonant frequency; numerical results of radiation resistance of current loop for typical values of parameters of interest; use of analysis for determination of radiation characteristics of circular-loop antennas. (a-3, b-1, c-1, d-5, e-0, f-Theory)

5220. STUCKEY, C. W., "The Hooded Antenna: An Approach to Meaningful Field Strength Measurements in Shielded Enclosures," Trans. IEEE, vol. EMC-7, no. 4, p. 360; December 1965. ABSTRACT: A technique is described for significantly reducing the effect of multipath interference on field strength measurements made in conventional shielded enclosures by hooding the receiving antenna. Field strength measurements in a shielded enclosure and corresponding measurements in the open field were made at frequencies from 1 to 7 Gc/s with and without an antenna hood. It was found that when the appropriate insertion loss constants are applied to the hooded antenna data taken in a shielded enclosure, the agreement between these data and the data from the same experiments performed in the open field without a hood is excellent. Principal advantages of the hooded antenna over anechoic

chambers include reduced cost, reduced inside space requirements for absorbing material, and applicability of use in most existing shielded enclosures. (a-1, b-1, c-1, d-1, e-0, f-Description)

5221. TURNER, E. M., "Hemispherical Scanning with Small Aperture Antennas," U.S. Air Force, Wright-Patterson AFB, Ohio, Air Force Avionics Laboratories, Antenna Radome Group; December 1965. ABSTRACT: To the knowledge of this author, electronic scanning has been confined to relatively large antennas. The process usually consists of controlling the amplitude and phase distribution of the currents across a wavelength aperture, with the current across each radiating element remaining essentially fixed. For many applications a relatively wide beam (50° to 70°) is desired. This type of beam can be scanned with a minimum of effort by switching the feed mechanism without requiring the use of phase shifters, directional couplers, rotators or isolaters. This approach makes scanning possible over wide angles and frequency excursions with relatively small, lightweight, high efficiency antennas. Although the use of this approach for large arrays has not been seriously studied, it appears promising. A statistical study of electronic equipment reveals that over 90% of all electronic gear is employed for receiving purposes, and that an even higher percentage is below 500 MHz. Although there is much equipment at L, S, C, and X bands, the amount of equipment whose average power is over 100 watts is very small. The techniques described herein are therefore applicable to a large percentage of applications in use today. I do not wish to imply that what I present here is necessarily limited in frequency to 500 MHz, or to power ratings of 100 watts. I do mean that as power density and frequency are increased, more attention must be given to the design tolerances, materials, switches, connectors, and transmission lines. Other approaches may become more competitive as the frequency is raised, but many uses will undoubtedly be found for these techniques even at X band. (a-1, b-3, c-1, d-1, e-0, f-Principles and description)

5222. WAIT, J. R., "Some Highlights of the URSI Symposium on Electromagnetic Wave Theory Held in Delft, The Netherlands, September 6-11, 1965," J. Res. Nat. Bur. Stand., vol. 69D, no. 6, p. 1691; December 1965. ABSTRACT: Under the auspices of the International Scientific Radio Union, a symposium on electromagnetic wave theory was held at the Technological University in Delft, Holland. The organizing and technical committee was under the chairmanship of Dr. F. L. Stumpers and the secretary was Dr. R. Timman. Other members of the committee were Professor H. M. Barlow (UK), Dr. P. Grivet (France), Professor O. E. H. Rydbeck (Sweden), Professor K. M. Siegel (USA), Academician V. I. Siforov (USSR), Professor G. Toraldo di Francia (Italy), and Admiral H. A. W. Goossens, Professor Dr. A. T. de Hoop, Dr. J. P. Schouten, Dr. B. D. H. Tellegen, all of the Netherlands. Actually, this symposium in Delft is a fifth in a quasi-periodic sequence. The predecessors were the Symposium on Microwave Optics at Montreal in 1953, the URSI Symposia on Electromagnetic Theory at Michigan in 1955; at Toronto in 1959, and at Copenhagen in 1962. The scientific program was grouped under the following subjects, which were announced in advance of submission of papers: Group: (1) Propagation in inhomogeneous media, (2) Antenna theory, (3) Propagation in plasmas, (4)Underground waves-space waves, (5) Boundary value problems, (6) Millimeter waves and optical waves, (7) Propagation in nonlinear media, (8) Surface waves and wave beams, (9) Coherence problems and modern optics (including wave front and statistical optics), (10) Multiple scattering, (11) Deterministic scattering. The papers which finally appeared on the program, by and large, could be fitted into the groups indicated above. However, it was evident that papers dealing with the classical aspects (e.g., Groups 2 and 5) received the most attention. In this connection, one wonders if many authors heeded the recommendation of J. B. Keller in his 1962 Copenhagen paper which is worth recording here: "It is essential that we infer general principles from all our results, and organize the results in terms of them. Otherwise our subject will degenerate into a collection of special solutions. This tendency is becoming especially ominous as computing machines invade diffraction theory." While many papers were presentations of "special solutions," there certainly were notable attempts by some authors to draw general conclusions from their analysis. In this present report of the conference, we shall identify a number of the papers which appear to provide new insight into the behavior of electromagnetic waves. Space limitations in this journal and the inability of this writer to be in attendance at both of the simultaneous sessions has resulted in the omission of mention here of other important papers presented at Delft. (a-1, b-1, c-1, d-12, e-0, f-Symposium)

5223. MAXWELL, E. L., "VLF Propagation and Noise Measurements in the Pacific," DECO Electronics, Inc., Boulder, Colorado, Contract No. Nonr-3387(00), Nr. 371-590; 15 December 1965. ABSTRACT: During May, June and July of 1965 the received field intensity from both VLF stations on Oahu Island, Hawaii were measured at Tokyo, Japan; Guam; and Boulder, Colorado. Atmospheric noise field intensities were also measured at all three sites and relative phase variations of the received signals were measured at Japan and Guam. This program presented a unique opportunity to study VLF propagation, since the paths from Oahu to Guam and Japan were almost the same length and were both all sea paths. The availability of two transmitters on Oahu which permitted simultaneous measurements at two VLF frequencies over the same path were also a unique opportunity. The results of this measurement program are presented in a number of ways in this report to afford maximum opportunity to study the propagation and atmospheric noise conditions. The results show 22.3 and 24.0 kHz to be the best frequencies of those measured for the Oahu to Guam and Japan paths. Significantly, the diurnal variations of field intensity were very repeatable even during sunset and sunrise transition times which indicates that better predictions of VLF field intensities may be possible with an improved propagation model. Means, medians, standard deviations, cumulative probabilities and diurnal variations of signal, noise and signal-to-noise-ratios have been computed, plotted and tabulated for all frequencies and for four hour time blocks and twenty-four hour periods. In addition, continuous plots of signal data for Japan and Guam are presented. (a-1, b-3, c-1, d-1, e-0, f-Measurements)

5224. PIERCE, C. H., "Manually Pointed Director for Shipboard Missile System. Analysis of Errors and Evaluation of Acquisition Possibilities Using Target Acquisition Unit MK-1 MOD 3," Johns Hopkins University, Applied Physics Laboratory, Silver Spring, Maryland, Report No. TG-753, Contract No. NOw-62-0604, ASTIA No. AD-481 192; November 1965. Corrected 30 December 1965. ABSTRACT: An analysis of director pointing error is presented for a target designation system employing Target Acquisition Unit MK-1 Mod 3, with respect to the rolling and pitching motions of an LST class ship combined with various designated elevations and relative bearings of a target in space. The error analysis then is used to develop comparisons of target acquisition capability for the manually-positioned director as functions of target elevation, target relative bearing, and amplitude of ship motion. It is generally concluded that this target designation system, when employed in an LST class ship with motion characteristics of reasonable expectancy, is severely limited by its scheme for designating relative bearing. Although errors in director elevation are within acceptable limits, the errors in directed relative bearing are excessive except for a few favorable combinations of target elevation and direction of approach. (a-1, b-3, c-1, d-1, e-0, f-Analysis and evaluation)

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ANONYMOUS, "A Panel Discussion-Some Electrical/Electronic Areas Requiring Emphasis in Preparation for Future Space Programs," Trans. IEEE, vol. AES-2, no. 1, p. 121; January 1966. ABSTRACT: A panel session held at the 1965 Aerospace Conference, Houston, Tex., June 23, 1965. Panelists discussed Life-Support System Interfaces with Electric Power; Communications; Navigation; System Integration for Future Space Programs; and Reliability. (a-2, b-1, c-1, d-1, e-0, f-Discussion)

ANONYMOUS, "Proceedings of the Tropospheric Refraction Effects Meeting. Volume II, Analytical and Experimental Refraction Research Results," Mitre Corporation, Bedford, Massachusetts, Contract No. AF 19(628)2390, ASTIA No. AD-628 772; January 1966. ABSTRACT: Volume II contains papers on certain refraction activities at the Eastern Test Range, the Electronic Systems Division, the Pacific Missile Range, the National Bureau of Standards, Ft. Huachuca, the Ballistic Research Laboratory, MIT Round Hill, Cold Lake, Canada, covering new measurement techniques, and discussing tropospheric and ionospheric effects on interferometer systems. (a-3, b-3, c-1, d-1, e-0, f-Experimental results)

ADY, R. M., KNOX, J. K., AND WONG, W., "Single Site Position Location Investigation," Applied Technology, Inc., Quarterly Report, Contract No. DA 28-043-AMC-01545(C), ASTIA No. AD-477 190; January 1966. ABSTRACT: This is the first Quarterly Progress Report of a one-year study of Single Station Position Location. The study is to be based upon computer processing and statistical analysis of the time series available from an AN/TRD-15 Direction Finder. This report describes progress made to date in assembling instrumentation, computer programs, and test plans prior to a preliminary collection of live and simulated signals at a field site. (a-1, b-3, c-1, d-1, e-98!, f-Progress report)

BARTON, F. S., AND WALKER, N. C., "The Contribution of Radio Telephony, Telegraphy, and the Later Electronic Techniques to Aviation," J. Roy. Aero. Soc., vol. 70, no. 661, pp. 230-231; January 1966. ABSTRACT: During the 1914-1918 War, Dr. James Robinson, while at Cranwell, had developed a Direction Finding System, which

was particularly applicable to aircraft and this became a regular feature of the equipment. Originally, the Direction Finding antennae consisted of loops of wire formed by running wires in tapes along the aerofoil surfaces and up and down the inter-plane struts in the days of the early biplanes, thus getting a loop of large effective area. In these early days, the frequencies in use were between about 500 and 1500 kcs. To make these Direction Finding antennas effective with the powers of ground stations then available, receivers of high sensitivity were required and these, with loops on the aircraft structure, immediately introduced the bugbear of "magneto noise". A great deal of experimental work was necessary to solve this problem, which was ultimately found to lie in the complete screening of the aircraft ignition system. This was far from acceptable to the engine and aircraft manufacturers, first because of the load which it placed on the ignition system and, second, because it added to the difficulties of maintenance and checking of that system. In the meantime, civil aviation was slowly growing, and radio telephony communication and direction finding from the ground became an essential part of civil airline equipment. Marconi Wireless Telegraph Company Ltd., with a team led by Captain Furnival, who had been at the original RFC Experimental Unit at Brooklands, were taking an active part in the design of equipment intended for this purpose. There were also international arrangements to be made which fell to the lot of the then RAF Headquarters, supported by the manufacturers and the RAE, when technical support was necessary. The RAF not unnaturally objected strongly to the trailing aerials, about 300 ft of wire with a lead weight on the end, which they inherited from the RNAS and RFC, and there were constant demands for a fixed antennae system which could be carried on the aircraft structure. As a consequence of this, it was necessary to go to frequencies which would be more compatible with such a small antennae structure and give reasonable efficiency. This led to considerable experimental work on transmitters and receivers, and intensified the importance of thorough screening. Due largely to the excellent design work of certain engine manufacturers, among whom the pioneer was Bristol with their radial engine, a sound mechanical totally-screened ignition system became available and, once its effectiveness had been realised, one of the obstacles in going to a shorter wavelength was removed. From about 1930 onwards, the 6000 kc band for aircraft to ground and inter-plane communications for the RAF, became a practical proposition and sets were designed by the RAE which went into service in considerable numbers and remained in service until well after the outbreak of the Second World War, in fact, this telephony equipment formed an important part of the plan for controlling fighter aircraft for the defense of the United Kingdom. In the meantime original work had been done in 1930-1932 by Cox Walker and Johnson-Ferguson which showed that a system on about 100-150 mcs was feasible. Aircraft antenna systems and interference levels were shown to be practical and a demonstration of an airborne system was given. The existing level of available techniques precluded the realisation of a practicable system at that time. Two important changes occurred in the period 1930-1940, the full import of which was probably not realised by those in the RAF concerned with them. First, it was decided in the light of a possible need for much greater quantities of equipment under the threat of war, to abandon the policy of going out to tender with a complete design and set of working drawings, but to invite the manufacturers to co-operate with the Design Establishment at an earlier stage and to suggest modifications to any piece of equipment which would, in their opinion, ease production in quantity and enable modern methods such as moulding and die-casting to be used. This wholehearted and freely-given co-operation from the manufacturers was largely responsible for equipment being available when needed. The other significant change was that, under the leadership of Sqn. Ldr. de Burgh who had taken over the direction of the Radio Department, RAE, from Sqn. Ldr. Leedham who moved to Headquarters, an influx of new recruits to the Department was authorised and a lively research team was formed, led by Dr. F. C. Bartlett, including Dr. Robert Cockburn, J. C. Stewart, J. E. Clegg and C. H. Smith. This team was given the task of designing ab initio a very short-wave fighter communication system on 100-150 mcs which, in addition to providing reliable air-to-ground communication, had also to provide the necessary direction finding facilities. The essential feasibility tests had been done (Cox Walker and Ferguson), and a sophisticated design was now prepared in co-operation with various firms in industry. The result of all this was that the RAF entered the War with a reasonably good fighter communication and direction finding system. It may be mentioned in passing that when a Mission from the United States visited England just before the beginning of the War and saw this equipment, they were so impressed with it and its purpose that they immediately copied it for their own use, as least on a stop-gap basis. One of the tasks laid upon the RAE was the development of radio-controlled pilotless aircraft. On the radio side "bell hanging", as it was unkindly known, fell primarily to the lot of Barton and Joyce, whereas the gyro, automatic controls and servo-motors known colloquially as the "plumbing" were handled by Gardner and Sudworth-Meredith occupying a sort of scientific co-ordinating function. The early trials were made in about 1923 from an aircraft carrier in the English Channel, with control and cinema camera observation from two accompanying seaplanes. Steady, but perhaps rather slow, progress was made until about 1927 when launches were made from a destroyer in the Bristol Channel. For these trials, a chain of four direction finding stations was sited along the Northern coast of Devon and Cornwall and this was, we think, the first use of telemetry in that the radio transmitter carried gave information as to the engine revolutions, the distance flown and the altitude, by simple variations of the radio signal primarily emitted for the use of the direction finding stations, from whose results a complete course was plotted. The work was then transferred to a full-size aeroplane, the Fairey 3D, from whence the project was nicknamed "The Faërie Queene", which is believed to be the first use of a "code name" to conceal a secret project. At about this time, the Navy pressed their need for an anti-aircraft practice target, and it was decided as a result of the experience already gained, that it would be quite possible to equip a Puss Moth aircraft with floats and all the control gear, and thus make a cheap and reasonably reliable anti-aircraft target. This was achieved about 1936 and before the War some hundred or more of these aircraft had been made and flown satisfactorily. Another electronic device originating from the old Royal Naval Air Service was a radio altimeter which had been suggested by Morris-Airey, later the Senior Scientist Engineer at HM Signal School, Portsmouth. It was based on the increase in capacity between two loops on the aerofoil surfaces of a seaplane as the latter approached the surface of the sea. It would not work with techniques then available. It was not until the late '30's that an altimeter was satisfactorily developed, and it was then based on ground reflection systems. Also developed in the 1920's was a ground-based navigational aid for aircraft, consisting of a rotating beacon whose directional element was a simple loop, the loop rotating once in sixty seconds, emitting a characteristic signal at a given point of the compass, thus enabling the observer in the aircraft using a simple receiver and a stop-watch, to determine his direction by noting how many seconds had elapsed between receiving the characteristic North signal and the minimum signal. Operational beacons for civil use were sited at Orfordness and Tangmere, 1929/31. In the early 1930's, an RAE "fog landing panel" was given the task of investigating the possibility of landing an aeroplane in practically zero visibility. A proposal to achieve this by means of loop direction finders on the aircraft had been made in the United States, and Barton went out to see this. Equally, in Germany the Lorenz Company had proposed a reflector beam system, and it was decided to carry out very thorough comparative trials of these two systems. A team led by Blucke and Cox Walker, with two special Monospar twin-engined aircraft, was set up, and extensive field trials carried out at Abingdon and elsewhere. The result of this was the adoption of the Lorenz system, and a British version of this was developed and installed at major airfields during the period 1938/40. From this has grown the present successful automatic blind landing system which in combination with a micro-wave altimeter was first successfully demonstrated by Touch at BLEU. In the beginning of 1935, Watson-Watt - who was then in charge of the Radio Research Board Station, Datchett, was consulted by H. E. Wimperis, the Director of Scientific Research at the Air Ministry, about the possibility of a radio detector and warning system. As a result, he made certain proposals based on experience in ionospheric research using pulse reflection and, in a Report to Wimperis, suggested a crucial experiment to demonstrate the validity of his theories. This was successfully accomplished. The RAE had already observed reflections from aircraft in their early experiments, the Post Office also had similar records, and the opening of the Alexandra Palace television transmitter very soon brought to light other examples. Wimperis, with Watson-Watt's aid, convinced the Air Staff of the potentialities of this system and authority was given for the setting up of a Research Unit headed by Watson-Watt, at Bawdsey on the East Coast, and this unit, breaking with all past tradition and going direct to the manufacturers, was able to achieve in some four years a warning ground radar chain essential for the defense of the United Kingdom. Watson-Watt's team, directed by A. P. Rowe, a former member of Wimperis's Staff and notably led by Dr. E. G. Bowen and A. G. Touch, quickly applied the pulse-reflection principles of radar to an airborne role, in the first place to air interception and surface vessel detecting devices. At the outbreak of War, this team was increased considerably by the recruitment of many outstanding scientists from the Universities and, led scientifically by Dr. W. B. Lewis, made a contribution which is already well documented. This included the blind bombing aid H_2S and the "Gee" and "Oboe" navigation systems of aid, in these the latter had a purely military application but "Gee", and the same principle as developed in "Loran", and H_2S, as the basis of the Doppler navigation systems, have found civil applications. The "Decca" hyperbolic navigational aid, using CW as opposed to the pulse system of "Gee" and "Loran" was also developed, by private enterprise, during the War. This contribution deals primarily with the early developments which naturally originated from the Service Research Organisations and so is biassed towards military aspects in the early history. In these early days there was no electronics industry, only one or two distinguished manufacturers well established in the telecommunications art. As aviation operations grew in importance and complexity, communication grew and gave rise to the developments in electronics. (a-1, b-1, c-1, d-5, e-0, f-Historical review)

CHRISTENSEN, K. K., ET AL., "Environmental Description of the Jansky and Bailey Test Site at Khao Yai, Thailand," Military Research and Development Center, Bangkok, Thailand, Report No. 66-015, ASTIA No. AD-479 848; January 1966. ABSTRACT: The Jansky & Bailey (J & B) forest site at Khao Yai National Park was inventoried during the first half of 1964 by a forestry team from the Royal Forest Department under ARPA contract. This site has been selected for testing by J & B of the effects of vegetation on short-range radio wave propagation. The Forest Department inventory supports the J & B work. Eighteen plots of various sizes were studied (12 plots of 10 × 40 m, 4 plots of 10 × 50 m, and 2 plots of 10 × 60 m). Forest profiles and plan views were drawn for each plot. The location of each tree within the plot was determined. All trees larger than 5 cm in diam were measured for height and diameter, and their species were recorded. Soil samples were taken. The forest in that area is typical Dry or Semi-evergreen forest, generally with a two-storied canopy. The lower story varies from 1.5 m to 18 m in height, and the upper story varies from 6 to 41 m. Ground covered by the canopy, as measured from the plans of the plots, is 60 percent. Average tree height is 10.7 m, with an average of 333 trees per acre. Average diameter is 0.161 m. Mean nearest neighbor distance was 1.73 m among the trees measured. There is considerable undergrowth, making penetrability on foot poor to very poor. Vegetative obscuration of horizontal and vertical visibility was also measured at each plot. In this forest it was found that the best ground-to-air observation angle is vertical. The average distance a man could be seen in this forest was 16.1 m. The soils varied from Loam to Silty Loam with some Sandy Loam (USDA). High specific gravities found in some soil samples indicate presence of heavy minerals. Vegetation biomass by plot ranged from 423 to 3,860 tons per acre, with an average of 1,535 tons per acre. (a-1, b-3, c-1 and 25, d-25, e-0, f-Description and analysis)

FELSEN, L. B., AND HESSEL, A., "Radiation and Guiding in the Presence of a Unidirectionally Conducting Screen," Trans. IEEE, vol. AP-14, no. 1, p. 62; January 1966. ABSTRACT: A modal method is employed to construct the solution for the fields radiated by a linearly phased electric line current and by an electric current element oriented arbitrarily in a plane parallel to an infinite, unidirectionally conducting screen. In addition to the radiation field which is calculated, these sources generate surface waves with drastically different behavior for the two types of excitation. This aspect, related to the anisotropy of the surface, is explored and is clarified by the consideration of a source of finite extent which reveals both the quasi-line source and quasi-point source characteristics. The peculiarities of surface waves on this anisotropic structure are given detailed consideration and are explained in simple physical terms. (a-1, b-1, c-1, d-1, e-0, f-Theory)

FRAENZ, K., AND ROTHE, P. G., "Relationship between Geometrical and Electrical Properties of Dipoles of Finite Length and Thickness," Nachrichtentechnische Zeitschrift, Communications Journal (NTZ-CJ), no. 1, pp. 17-20; January 1966. ABSTRACT: It is obvious that the electrical properties not only of dipoles, but often also of resonators and transmission lines, are determined entirely by the geometry of the conductors. In this paper the dipole will serve primarily as an example; our main intent is to introduce new methods of deriving relationships between geometrical and electrical properties, which at least in the case of the dipole, are more suitable for lucid presentation of these relationships than conventional methods. What has been the usual approach to the dipole theory up to now? For instance, a boundary-value problem of a partial differential equation is solved by developing the fields by series of Besselfunctions and spherical harmonics and finding the approximate solution for a system comprising an infinite number of equations with an infinite number of unknowns. When all this is accomplished the electrical quantities to be determined can be expressed as functions of geometrical parameters. The intricate procedure often required to derive quite simple relationships between electrical and geometrical quantities may perhaps be attributable to the one-sided interest in periodic excitation and to the lack of application or even discussion, as mathematical aids in dipole theory, of other types of excitation. While this is understandable since carrier-frequency transmission is the main technical application of antennas, it is not really in the nature of antenna physics. The physicist is acquainted with simple geometrical optics, with physical wave optics to which belongs the difficult theory of diffraction of periodical fields as well as with quantum theory, in which the corpuscular aspects of electromagnetic fields can be treated on the basis of simple models. The results of the dipole theory which will be reported here are attainable, in the first place, through investigations into excitations of time dependence

$$e^{pt} = e^{(\nu + j\omega)t}$$

with $\nu \neq 0$ (not just the special case $\nu = 0$) and secondly, through investigations into discontinuous excitations. The older and new results of the dipole theory lend themselves to a simple mathematical classification: The impedance Z of a dipole is a positive function of the complex frequency p, just like the impedance of a network comprising a finite number of lumped circuit elements; Z(p) has a simple pole at p = 0 and an essential singularity at p = ∞. With regard to many of the dipoles found in practice, the theory of the small dipole yields exact expressions for the first three nonvanishing terms of the Laurent series at p = 0, but the higher terms are not obtainable. (a-1, b-2, c-1, d-4, e-0, f-Theory)

GETHING, P. J. D., "High-Frequency Direction Finding," Proc. IEE, vol. 113, no. 1, p. 49; January 1966. ABSTRACT: The principles underlying high-frequency direction finding are summarised and relevant literature is reviewed. Various forms of direction finder are briefly described. The principal sources of error, including propagation effects, and the statistical problem of combining bearings into a fix are discussed. It is generally accepted that improved accuracy is most likely to be obtained with wide-aperture systems, combined with greater use of information about the ionosphere and the propagation modes involved: this view is supported by the literature reviewed. (a-1, b-1, c-1, d-5, e-900, f-Principles and review)

GIKOW, E., "Wide Dynamic Range Preselectors," Trans. IEEE, vol. AES-2, no. 1, p. 94; January 1966. ABSTRACT: Crowding of the Military communication spectrum has aggravated the need for preselectors capable of receiving a low-level desired signal in the presence of a high-level adjacent channel signal. Described herein are two novel HF preselection approaches which appear eminently suitable to cope with this problem. Applicable to the frequency range of 2 to 30 Mc/s, one preselector employs parametric mixing and the other exploits the low loss properties of superconductivity. In addition to other advantageous features, both preselectors have demonstrated an outstanding dynamic range capability in the order of 140 dB. Each of the preselectors is evaluated as a conventional filter. In addition, performance data of a high quality military receiver is compared with that obtained when the receiver is preceded by each of two preselectors. Considerable stress is placed on the use of cross-modulation characteristics as a more meaningful and precise measure of preselector performance. (a-1, b-1, c-1, d-1, e-880, f-Description)

GRIFFIN, M. D., "Microwave Azimuth Measuring System," Trans. IEEE, vol. AES-2, no. 1, p. 89; January 1966. ABSTRACT: A breadboard microwave pointing device (ElectroTransit) has been designed, fabricated, and tested. The device and accompanying RF sources comprise a portable, battery-operated, azimuth angle measuring system with application in surveying, mapping, and geodesy, and for conducting basic research in tropospheric propagation and turbulence studies. The angle measuring sensor combines a K_a-band interferometer with an optical theodolite to provide two modes of pointing. Azimuth angle can be read directly to 0.1 arc-second. Preliminary tests on the interferometer show a pointing repeatability on the order of two arc-seconds, three sigma, when tropospheric turbulence is minimum and a mean absolute error of less than 10 arc-seconds, three sigma, compared with first-order optical standards. This paper describes the design, fabrication, and testing of this extremely precise instrumentation. (a-1, b-1, c-1, d-1, e-0, f-Description)

HATCH, J. F., STRUSZYNSKI, W., AND THURGOOD, H., "The Marconi Eight Aerial Adcock H.F. Direction Finder Type S.480," Marconi Review, vol. XXIX, no. 160, p. 1, 1st Quarter; 1966. ABSTRACT: The development of a new type of hf direction finder is described with particular attention to improvements in accuracy, sensitivity, polarisation error protection and increased frequency coverage (1.5-30 Mc/s). A new design of ferrite cored radiogoniometer with eight field coils and twin search coils is incorporated, with a twin channel receiver and crt display giving instantaneous bearing readout. As the radiogoniometer is connected between the aerials and the receiver, it can be used as an error-correcting device, which eliminates the effect of small phase and amplitude differences in the receiver channels. A new design of aerial element, with elevated feed, has been developed which improves the vertical polar diagram of reception for shallow angle rays where the physical height of the aerials is greater than 1/2λ. This is the first eight aerial Adcock system to realise the predicted theoretical advantages of the multi-aerial system, which previously has been the subject of investigation by many different workers in the field. Operational trials under controlled conditions have shown up the improved accuracy, pick-up factor and simplicity of operation in comparison with other systems. (a-1, b-2, c-1, d-5, e-986, f-Description and analysis)

KODIS, R. D., "A Note on the Theory of Scattering from an Irregular Surface," Trans. IEEE, vol. AP-14, no. 1, p. 77; January

1966. ABSTRACT: Integral formulas are developed directly from vector field theory for scattering by a perfectly conducting irregular surface at very short wavelengths. It is shown that, in the optical limit, the back-scattered field has no cross polarized component. When the integrals are evaluated asymptotically by the method of stationary phase, it turns out that to a first approximation the back scattering cross section is proportional to the average number of specular points which are illuminated at a given angle of incidence and to the geometric mean of the principal radii of curvature at those points. The scattering problem is, thus, transformed to a problem in the statistical geometry of irregular surfaces. (a-1, b-1, c-1, d-1, e-0, f-Theory)

REMLEY, W. R., "Doppler Dispersion Effects in Marched Filter Detection and Resolution," Proc. IEEE, vol. 54, no. 1, p. 33; January 1966. ABSTRACT: Conventional matched filters which use pseudorandom or noise-like waveforms attempt to compensate for the Doppler effect by cross-correlating the received waveforms with frequency shifted replicas of the transmitted waveform. However, frequency translation is only an approximation to the actual Doppler effect which is a time-expansion or time-compression of the waveform resulting from the continuous expansion or compression of the transit path. This paper investigates the effects of Doppler dispersion in matched filters which use frequency translation for Doppler compensation. It is found that the effects of Doppler dispersion are independent of the carrier frequency and negligible if the dispersion product, i.e., the absolute magnitude of the product of the signal bandwidth, duration, and delay rate, is less than unity. If the dispersion product is greater than unity the dispersion effects are serious. In the latter case, the time and frequency resolution of the system are degraded and the output pulse is reduced in amplitude. The maximum improvement that can be obtained in the signal-to-noise power ratio is equal to the reciprocal of the delay rate magnitude. This maximum signal-to-noise gain is achieved when the time-bandwidth product of the receiver is chosen such that the dispersion product is approximately unity. (a-1, b-1, c-1, d-1, e-0, f-Theory)

RUDDUCK, R. C., "Application of Wedge Diffraction to Antenna Theory," Ohio State University, Research Foundation, Columbus, Ohio, NASA Grant No. NsG-448; January 1966. ABSTRACT: The method of applying geometrical optics techniques to diffraction by antennas and scattering bodies is outlined. The basic technique employs diffraction by a conducting wedge, and may be applied to antennas and scatterers which can be modeled from wedges. This method is an extension of the Geometrical Theory of Diffraction. Three formulations of the solution to wedge diffraction are used for various conditions of application. The basic characteristics of each formulation is discussed. The method is discussed in detail by application to calculation of the radiation patterns of parallel-plate waveguides. The treatment of radiation patterns of pyramidal horn antennas and rectangular waveguides, and diffraction by thick walls is outlined. The application of this method to analytical determination of gain, effective aperture, and aperture admittance of parallel-plate guides and coupling between guides is discussed. (a-1, b-3, c-1, d-1, e-879, f-Theory)

SALKELD, E. M., "Development of a Precise Geodetic Survey System," Trans. IEEE, vol. AES-2, no. 1, p. 48; January 1966. ABSTRACT: The development of a system to perform first-order airborne geodetic surveying is described. It is shown how existing distance measuring techniques were applied to solve the operational requirement for a system that can measure the length of lines up to 900 nautical miles long with a probable error of 0.0017 nautical miles, and determine the nadir points of aerial photographs within twenty-four feet for ninety percent of the measurements. The implementation of the Distance Measuring Equipment (DME) using a CW carrier phase-modulated by four ranging tones is described at the block diagram level. It is shown that modulation with a large index (twelve radians) reduces the ranging errors associated with multipath propagation which formerly were a significant source of error in DME systems. Results of a flight test program are presented. (a-1, b-1, c-1, d-1, e-0, f-Description)

SMITH, P. G., "Measurements of the Complete Far-Field Pattern of Large Antennas by Radio-Star Sources," Trans. IEEE, vol. AP-14, no. 1, p. 6; January 1966. ABSTRACT: A correlation technique for measuring the complete far-field patterns of large-aperture antennas is described and evaluated analytically. The technique uses radio-star sources and employs an auxiliary antenna for providing a reference signal for crosscorrelation with the test-antenna signal. The major advantages provided by the correlation method, relative to single-antenna radiometric systems, are improved sensitivity, greater interference rejection, and the capability for measuring polarization and phase responses of test antennas, in addition to their gain pattern. Full realisation of the ultimate capabilities of the technique requires the performance of crosscorrelation for high ratios of pre-detection to post-detection bandwidths. (a-1, b-1, c-1, d-1, e-0, f-Description and analytic evaluation)

TAYLOR, J., POSEY, K. A., AND HAGN, G. H., "Literature Survey Pertaining to Electrically Small Antennas, Propagation through Vegetation, and Related Topics," Stanford Research Institute, Menlo Park, California, Contract DA 36-039-AMC-00040(E), Special Report No. 17, ASTIA No. AD-629 155; January 1966. ABSTRACT: Bibliographical references, with abstracts wherever possible, are given for reports, papers, and books pertaining to the theory and practical use of electrically small antennas in a variety of environments and locations. References are grouped by content into categories: electrically small antennas; matching circuits and antenna impedances; ground constants; ground proximity loss; buried antennas; propagation over lossy ground; propagation through stratified media; propagation through vegetation; patterns and directivity of antennas over lossy ground; books, bibliographies, and surveys; and general, including historical reviews. A list of authors and an index of cross references between categories are provided. The dates of the references extend from pre-World War II to early 1966, with the preponderant emphasis on the period 1960-1966. (a-1, b-3, c-1, d-1, e-0, f-Literature bibliography)

WATSON-WATT, R., "A Discourse," J. Roy. Aero. Soc., vol. 70, no. 661, pp. 232-234; January 1966. ABSTRACT: This paper is a historical review written especially for the centennial edition of the publication. An excerpt from the paper follows: "... Robert Watson-Watt found himself withdrawn from the purely academic world in 1915, when he was invited, through channels which he has never explored, to join the Meteorological Office and, practicularly the then young Branch Meteorological Office within the Royal Aircraft Establishment at South Farnborough, Hampshire. There, in such intervals as the demands of conventional meteorological work permitted, he was able to advance the young science and art of Radio Meteorology. An enthusiastic amateur meteorologist, C. J. P. Cave; who could not for long be marked with the somewhat derogatory adjective, had brought from Budapest, in or about 1910, a pen-writing radio-atmospheric recorder which was soon, by the joint work of Cave and Watson-Watt, replaced by much more informative equipment. Watson-Watt's "Instantaneous Visual Radio Direction Finder", which depended on the cathode-ray oscillograph for its utility, was conceived in 1915, but had to await considerable advances in the cathode-ray tube, which became very useful in 1922-23. This device is now very widely distributed over the scientific and technical world of meteorology and of relative sciences. In the decade 1922 to 1932 the germs of radar became faintly visible, and they bloomed in 1935. The history of radar from that date is now familiar, but it is not widely recognised that it grew from the soil of meteorology." (a-1 and 4, b-1, c-1, d-5, e-0, f-Historical review)

DARLING, C. A., "A Precision Tracking Drive System," General Time Corporation, Stanford, Connecticut, Final Report No. 8138, Contract No. AF 19(628)3293, ASTIA No. AD-631 706; 5 January 1966. ABSTRACT: This report covers the modification of a Rawin Set AN/GMD-2 azimuth and elevation tracking system to provide improved tracking characteristics and conversion to solid-state circuitry throughout the control system. The analyses leading to the design of satisfactory compensation circuitry are described, as are the special test units used in measuring functions and responses. (a-1, b-3, c-1, d-1, e-0, f-Rawin modification)

CHASE, W M., ET AL., "Shipboard Interference Simulator," U.S. Navy Electronics Laboratory, San Diego, California, ASTIA No. AD-630 989; 12 January 1966. ABSTRACT: A shipboard interference simulator has been designed which accurately reproduces the potential frequencies of interference derived from the intermodulation between any combination of simultaneous transmitter fundamental frequencies up to a total of ten. The relationship of interference-signal magnitudes is in reasonable agreement with similar signals actually measured aboard ship. The simulator is a valuable laboratory tool, since it represents an analog computer with which detailed knowledge of intermodulation phenomena can be increased. This is especially true when many more than the classic two fundamental signals are on together. The simulator has proved its worth as an excellent aid in demonstrations of intermodulation interference before Naval personnel concerned with shipboard communications problems. It is believed that a simulator in which the oscillators are on operational transmit frequencies can be of great help to frequency planners and users of allocated frequencies in determining and avoiding self-generated interference aboard ships. (a-1, b-3, c-1, d-1, e-0, f-Description)

MARION-DAVIS, D., "Apollo Direction Finder Tested," Electronic News, 17 January 1966 ABSTRACT: First flight tests of the AN/ARD-17 VHF/S-band direction-finding receiver, for Apollo spacecraft post-landing recovery homing, were made by the Manned Spacecraft Center here last week. The tests, performed off Galveston Island in the Gulf of Mexico, used an Apollo boilerplate spacecraft and an Air Force HC-130-H air rescue craft, to determine the range of the direction finding receiver on board the aircraft with the Apollo recovery beacon and survival radio on the spacecraft in the Gulf. Cook Electric Co., Morton Grove, Ill., is contractor for the equipment under MSC funding to the Air Force Systems Command, Wright-Patterson AFB, for $6,232,000. The contract includes development and fabrication of the original unit, spare parts, training aids, manuals and bench mockups, until all units are installed on the recovery aircraft. MSC's landing and recovery division made homing runs from varying altitudes of 28,000 feet down to 500 feet, in the tests. MSC officials said the equipment performed with line-of-sight acquisition of the spacecraft on all homing runs by the aircraft. Acquisition was made on line-of-sight from 21 nautical miles out, when the aircraft was at 28,000 feet. The homing device, being installed on all HC-130-H air rescue service aircraft, will have the capability of tracking the spacecraft in earth orbit on earlier Apollo flights, as well as during the reentry phase it was said. Installation is expected to be completed in about 1 year. An unspecified number of the air rescue aircraft, equipped with the homing equipment, will be used to cover the landing "foot-print" of the Apollo spacecraft returning from the moon flight, according to reports. (a-1, b-2, c-1, d-1, e-0, f-Evaluation)

ANONYMOUS, "Crossed Spaced Loop HF DF Antenna," USN, DES DEV Group II; January/February 1966. ABSTRACT: The crossed spaced loop antenna was installed on the after trellis ECM mast on USS BROWNSON (DD 868) during the week of 11 January 1966. Several receiver systems were installed in the DASH hanger to obtain calibration curve and sense performance data over the 2 - 50 mc frequency range for the crossed spaced loop antenna. Tests were conducted during the period 14 - 16 January 1966 in Narragansett Bay. COMDESDEVGRU TWO 73' sound boat, operating at a radius of 600 yards from the BROWNSON, made approximately 100 circular runs to obtain calibration data on 17 frequencies in the 2 - 50 mc frequency region. Calibration data was recorded by Southwest Research Institute engineers for analysis, the results of which will be promulgated at a later date. (a-5, b-3, c-1, d-1, e-894, f-Evaluation report)

BELL, D. A., "Self-Focusing Receiving Array," Proc. IEE, vol. 113, no. 2, p. 294; February 1966. ABSTRACT: In the paper by Withers, et al. [Proc. IEE, 112, (9), p. 1683], the frequency separation between pilot and signal could be minimised by a modification. If f_p is heterodyned with a local oscillator of frequency f_h (common to all channels), a new frequency $f_q = f_p + f_h$ can be generated in order to produce an intermediate frequency $f_s - f_q$, which is not limited to being equal to $f_s - f_p$. Hence, the latter difference can be made as small as filtering technique permits, and in the limit f_p might be a carrier (possibly enhanced) associated with f_s. The practical difficulty with such a scheme is its dependence on the phase stability of the narrow-band filter involved. A possibly disadvantageous operational feature of associating f_p closely with f_s is that the system would be truly omnidirectional, instead of having a preferred direction controlled by the independent pilot. I think the authors are too pessimistic on signal/noise ratio, since I cannot accept their statement in Section 5 that the signal/noise ratio of an array of fairly widely spaced elements deteriorates for other than broadside reception. The constancy of signal/noise ratio with angle can be deduced from either of two models, assuming, for simplicity, that the resistance representing losses in the array structure is small compared with radiation resistance. First, consider an array in a large isothermal enclosure (somewhat comparable with an integrating sphere in photometry), with only the feeder brought out to the observer; the observer must find Johnson noise corresponding to the radiation resistance and the temperature of the enclosure. Provided that the mutual impedance between elements of the array is small, the radiation resistance of the array is not affected by phase shifts in the feeds to individual elements, and therefore the noise is independent of the direction in which the array is steered. Secondly (and equivalently), consider an array situated in a region which is homogeneous from the point of view of noise; the flux of noise radiation will be the same in all directions. But the effective area of the array (under any given phasing conditions) is measured by the signal power collected from a given signal flux, i.e. it is proportional to the directional gain, and the noise power collected is the product of noise flux and effective area. Therefore the signal/noise ratio depends only on the power fluxes of signal and noise fields, the effective area being the same for both. It should, perhaps, be emphasised that this conclusion is based on the assumptions that (i) the radiation resistance is large compared with the loss resistance of the array, which should be true when resonant elements are employed, and (ii) mutual coupling between elements is a minor effect, which I believe the authors have both assumed and experimentally justified for the array described in Section 6. (a-1, b-1, c-1, d-5, e-0, f-Discussion)

FALLSIDE, F., AND BICKLEY, D. T., "Nonlinear Delay Line with a Constant Characteristic Impedance," Proc. IEE, vol. 113, no. 2, p. 263; February 1966. ABSTRACT: It is shown that for a lossless nonlinear transmission line in which both the series inductance per unit length L(i), and the shunt capacitance per unit length C(v), are amplitude dependent, the phase velocity is given by $u = 1/\sqrt{[L(i)C(v)]}$ and the characteristic impedance is given by $Z_0 = \sqrt{[L(i)C(v)]}$. By appropriate choice of the functions L(i) and C(v), there is a class of lines whose variation in phase velocity with signal amplitude is greater than in partly nonlinear lines (where only the inductance or the capacitance is nonlinear), and whose characteristic impedance is constant and not amplitude dependent. The theory of this type of line is given, together with results from an experimental lumped line which employs saturating inductors and varactor diodes. The theory of this type of line is given, together with results from an experimental lumped line which employs saturating inductors and varactor diodes. The line has a delay which is variable over the range 0.8-4 μs and shows a good agreement with theory. For small-signal plus bias inputs the line behaves like a linear line, except that its delay and cutoff frequency are determined by the amplitude of the bias. For large-signal operation there is considerable distortion, and shock waves can be formed. (a-1, b-1, c-1, d-5, e-0, f-Theory with experimental results)

MAXWELL, L., AND MARAZZI, C., "Synthesis of Counters with Any Kind of Feedback," Proc. IEE, vol. 113, no. 2, p. 271; February 1966. ABSTRACT: Algebraic expressions may be used to describe the analysis of digital counters with various types of feedback loops. It will be shown that such expressions may also be used to advantage in realisation procedures of the synthesis of counters. Design procedures are shown for the synthesis of counters with specified periodic sets of bases. (a-1, b-1, c-1, d-5, e-0, f-Theory)

WAIT, J. R., "On the Theory of Wave Propagation in a Bounded Compressible Plasma," Can. J. Phys., vol. 44, no. 2, p. 293; February 1966. ABSTRACT: The influence of boundaries on wave propagation in a compressible plasma is considered. Although the models chosen are highly idealized, a number of interesting complexities arise that may be significant in actual bounded plasma configurations. For example, it is demonstrated that a perfectly conducting metallic boundary will support a surface wave in the plasma. However, if the boundary is not perfectly rigid, the surface wave will be attenuated even when the plasma is collisionless. Certain aspects of multiple reflections between two parallel boundaries are also treated in the paper. (a-1, b-1, c-1, d-5, e-0, f-Propagation study)

SEELEY, E. W., "Broad-Band VLF Transmitting Terminated Dipole," Naval Ordnance Laboratory, Corona, California, NOLC Report No. 638; 7 February 1966. ABSTRACT: The need is cited for an efficient, easily constructed broad-band VLF transmitting antenna for ionospheric and other research. A multiconductor horizontal dipole is investigated experimentally and theoretically. The radiated E-field equations are derived for the terminated dipole, and field-strength measurements made out to 1400 km confirm the equations. Two such dipoles (a 5-conductor over soil of 16 mmho/m conductivity, and another with 10 conductors over a lava bed of 0.8 mmho/m conductivity) were constructed in the California desert. Measurements made yielded design data: impedance measurements to obtain propagation constants, bandwidth, attenuation per unit length, and mutual and characteristic impedance. Methods of improving efficiency of the horizontal dipole are discussed. (a-1, b-3, c-1, d-1, e-892, f-Study and investigation)

BHATTACHARYA, H., AND RAO, M., "Effect of Ionospheric Reflections on the Nature of the Waveforms of Radio Atmospherics," Radio Science, vol. 1, no. 3, p. 309; March 1966. ABSTRACT: It is well known that ionospheric reflections modify the shape of the waveforms of atmospherics. In this paper an attempt is made to deduce theoretically the shape of the waveform of the pulse radiated by a lightning discharge, after it has undergone successive reflections at the ionospheric layer. To this end, the return-stroke current due to the lightning discharge is assumed to follow the usual double exponential formula with Kimpara's values of the constants. The ionosphere is taken to be a sharply bounded homogeneous medium and the geometric reflection is assumed to hold. Using Fresnel's reflection coefficient, an expression is obtained for the final shape of the reflected pulse. The plots of this expression for the different orders of reflection show that relative to the amplitude of the positive half of the reflected pulse waveform, the negative half increases in amplitude with the order of reflection. It is observed that there is a decrease in the quasi-frequency

of the reflected pulse waveform with the increase in the order of reflection. Some reflection types of waveforms have actually shown these features. (a-1, b-1, c-1, d-1, e-0, f-Theory)

FELPERIN, K. D., "Comparison of Time-Delay Spread and Spatial Coherence for Ionospheric Propagation," Radio Science, vol. 1, no. 3, p. 285; March 1966. ABSTRACT: This paper describes spatial selective fading (interference patterns due to modal arrival angle differences) as a homogeneous random process. It is shown that for ionospheric propagation, the power spectrum in vector wave number (wave number dispersion profile) should be of approximately the same shape as the power spectrum in time delay (time-delay profile). On the basis of this similarity, it is suggested that the correlation between signals from spaced antennas (spatial coherence) should be inversely proportional to rms time-delay spread. An experiment was performed on a 4100-km path at 7 and 14 Mc/s to verify this assumption. Results are generally in agreement with theory, and discrepancies that do exist are analysed. (a-1, b-1, c-1, d-1, e-0, f-Theory and description)

HARRINGTON, R. F., AND RYERSON, J. L., "Electromagnetic Scattering by Loaded Wire Loops," Radio Science, vol. 1, no. 3; March 1966. ABSTRACT: The problem of electromagnetic scattering by circular wire loops loaded with lumped impedances along the wire is considered. A solution to the appropriate integral equation is obtained by a Fourier series method. The theory is valid for loops in arbitrary impressed fields, and for both monostatic and bistatic scattering. Previously obtained solutions for the loop antenna, the loaded loop antenna, and the unloaded loop scatterer are contained in the solution as special cases. (a-1, b-1, c-1, d-1, e-0, f-Theory)

HURD, R. A., "A Note on the Evaluation of Some Constants of Antenna Theory," Radio Science, vol. 1, no. 3, p. 411; March 1966. ABSTRACT: This paper extends some earlier work on K.S. Kunz (J. Res. Nat. Bur. Stand., vol. 67D, no. 4, July/August 1963) wherein Kunz developed an asymptotic expression for the current on the outside of an infinite tubular antenna fed at the δ gap. (a-4, b-1, c-1, d-1, e-0, f-Theory)

IBUKUN, O., "Structural Aspects of Atmospheric Radio Noise in the Tropics," Proc. IEEE, vol. 54, no. 3, p. 361; March 1966. ABSTRACT: The amplitude probability and pulse rate distributions of noise envelope have been made the basis of a study of some structural aspects of atmospheric radio noise in a tropical area. The lognormal character of radio noise in the tropics has also been investigated. Direct comparisons are made with results obtained in temperate latitudes. The differences in the structural characteristics of noise have been related to intense local thunderstorm activity on tropic land masses. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

JACOBES, J. A., AND WATANABE, T., "Doppler Frequency Changes in Radio Waves Propagating Through a Moving Ionosphere," J. Res. Nat. Bur. Stand., vol. 1 (new Series), no. 3, p. 257; March 1966. ABSTRACT: Doppler frequency changes for a vertically incident and reflected radio wave caused by a redistribution of electrons in the ionosphere due to drift motions set up by an electric field across the earth's main magnetic field are discussed. The Doppler frequency change is given as a linear function of the two horizontal components of the electric field with coefficients which are functions of the relevant ionospheric parameters and the frequency of the sounding radio wave. The Doppler frequency change can also be given as a function of the intensity of the magnetic variation, provided that a suitable relation can be found between the intensity of the magnetic variation observed on the earth's surface and the intensity of the electric field in the ionosphere. The Doppler frequency change has been given in this way for two cases: one is for a uniform time-changing magnetic field parallel to the geomagnetic axis which roughly represents the Chapman-Ferraro field for sudden commencements of geomagnetic storms. The other is for the field due to alternating electric currents in the ionosphere. Several theoretical predictions have been made which can be compared with observations. The amount of the Doppler shift is about 1 c/s in middle latitudes for a 4-Mc/s sounding wave for a sudden commencement with a time scale of 4 min. and magnitude several tens of gammas. The Doppler shift due to alternating currents in the ionosphere amounts to only 1 c/s for a 4-Mc/s radio wave with a 50-γ amplitude of oscillation in the magnetic field intensity. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

KING, R. W. P., AND WU, T. T., "The Electric Field Very Near a Driven Cylindrical Antenna," Radio Science, vol. 1, no. 3, p. 353; March 1966. ABSTRACT: A first-order formula is derived for the component $E_z(\rho, z)$ of the electric field very near to the surface and parallel to the axis of a perfectly conducting center-driven cylindrical antenna with radius a and length $2h$. It has the form $E_z(\rho, z) = E_z(z)\ln(\rho/a)$ where ρ is the radial distance from the axis of the antenna and $E_z(z)$ is a complicated expression that involves generalized sine and cosine integral functions. Zero-order results are compared with first-order values for half- and full-wave dipoles with $a/\lambda = 7.022 \times 10^3$. It is shown that zero-order values do not include large values of $E_z(\rho, z)$ near the ends and near the driving point, so that a quantitative estimate of the field near a center-driven cylindrical antenna requires a first-order evaluation. (a-1, b-1, c-1, d-1, e-0, f-Theory)

KUZNETSOV, V. D., AND PARAMONOV, V. K., "Dipole Provided with a Reflector Fed by a Directional Coupler," Elektrosvyaz (Electrical Commun.), no. 3, pp. 26-33; March 1966. ABSTRACT: Not available. (a-4, b-2, c-2, d-2, e-0, f-0)

SINHA, A. K., AND BHATTACHARYA, P. K., "Vertical Magnetic Dipole Buried Inside a Homogeneous Earth," Radio Science, vol. 1, no. 3, p. 379; March 1966. ABSTRACT: The radiation characteristics of a low-frequency vertical magnetic dipole antenna buried inside a semi-infinite conducting medium have been investigated to determine the electric and magnetic fields at any point inside or outside the conducting medium. Some special cases of interest have been discussed. The results have been used to find the input impedance of the dipole inside the conducting medium. (a-1, b-1, c-1, d-1, e-0, f-Study and investigation)

STARK, L., "Radiation Impedance of a Dipole in an Infinite Planar Phased Array," Radio Science, vol. 1, no. 3, p. 361; March 1966. ABSTRACT: The radiation impedance of a dipole in an infinite array phased for any angle of radiation is calculated. The calculation is made by means of plane wave expansions and gives a very simple result. The radiation resistance is the product of the broadside resistance times a scanning factor which is unity on broadside and changes the resistance as the beam is scanned. The scanning factor is identified as the product of the element pattern and a factor equal to the ratio of the broadside aperture to the projected aperture. The radiation reactance is also calculated and consists of a leading term due to reflection of the wave fronts from the ground plane plus an infinite series of higher order-terms contributed by the cutoff wave. Results are plotted for the variation of radiation resistance and reactance with changes in radiation angle. A comparison is also made between results calculated by the method of plane wave expansions and those obtained from the method employing mutual impedance coefficients. (a-1, b-1, c-1, d-1, e-0, f-Theory)

TRAVERS, D. N., "Development of a High Frequency Interferometer Radio Direction Finder," Southwest Research Institute, San Antonio, Texas; 10 March 1966. ABSTRACT: Direction finding technology has advanced over the years chiefly by the process of applying newly developed instruments to very well-known theoretical concepts. Because the technology of fast RF phase measurements, particularly those involving ambiguities, has been slow to develop, phase comparison direction finding methods have not as yet been adequately developed. Applications in this technical area since World War II have been primarily special case situations, but within the past few years, an increasing number of workers have successfully used new and special receivers, computers and other instruments to produce some degree of wideband HF phase comparison or interferometer radio direction finding performance. Although such results have been obtained under laboratory conditions, they have consistently shown that interferometer direction finding is feasible and offers great improvements over conventional existing systems for several reasons. (1) The antenna array is very greatly simplified so that only three to five antennas are required for wide aperture coverage. (2) Both azimuth and elevation coverage are provided over an entire hemisphere, as opposed to azimuth only at low elevation angles for most conventional systems. (3) All specialized instruments, receivers and electronic devices needed to construct a wideband interferometer direction finder for HF can now be purchased commercially. The interferometer direction finding method is therefore one which can be engineered into a working system with existing technology. This proposal is for the development of a feasibility model of a 2.5 to 10 Mc/s interferometer direction finder which will be delivered to the U.S. Army. (a-1, b-3, c-1, d-1, e-1000, f-Proposal)

ANONYMOUS, "Techniques for Integrating Solid-State Circuitry into Antennas," Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio, Technical Report No. 2142-3, Interim Technical Report; 20 March 1966. ABSTRACT: An analysis is given on higher-order wave-

guide mode excitation and superposition, for synthesizing increased-directivity source distributions. Consideration is given to obtaining increased directivity from multiport spiral antennas. A technique is given for reducing slot-antenna pattern distortion resulting from a finite ground plane. Pattern ripple is shown to be reduced from 2.0 dB to 0.4 dB. A multiport Archimedes Spiral Antenna utilizing parasitic excitation is described and test patterns are shown. Integration of amplifiers into a two-element interferometer direction-finding system is discussed. A comparison on existing amplifiers and amplifier requirements for the direction-finding system is presented. The feasibility of increasing the dynamic range of transistorized amplifiers by as much as 25 dB is demonstrated. Finally, the design of two identical ~35 MHz amplifiers which have a 4.5 dB N.F., 20 dB gain, a 50 MHz bandwidth, a cross-modulation level of 140 mV, and nearly identical phase characteristics is given. A digital work generator for use with an eight-element slot-array operating at a 2 MHz clock rate and capable of operation in either an automatic mode or single-pulse mode is described. The design and initial test results for an accurate broadband phase detector for use with a 1 GHz slot-antennamitter and capable of performing accurately over a 13 dB input power range are presented. Design considerations for an eight-element slot-antennafier array are given along with a description and evaluation of the work completed. A description of the logic system and circuitry for use with the antennafier array is given. A design and analysis of a 1 GHz cavity-backed slot-antennamitter is presented. Results indicate the device is capable of 1/4-watt power output at frequencies between 800-1200 MHz. Circuitry, both RF and digital, for a phase-locked slot-antennafier array element is given. (a-1, b-3, c-1, d-1, e-976, f-Analysis)

SVOBODA, D. E., "Some Characteristics of an Optimum Directivity Broadside Array of Half-Wave Dipoles above a Ground-Plane," Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio, Technical Report AFAL-TR-66-95; 20 March 1966. ABSTRACT: A number of properties of small superdirective broadside arrays of half-wavelength dipoles are investigated. These include directivity, beamwidth and required excitation accuracy as a function of the number of elements and the spacing. Using a required excitation accuracy of one per cent as a practical limit it is concluded, that for moderate half-power beamwidth requirements, a considerable reduction in the array length from that of a uniformly illuminated array can be obtained by using an optimum current distribution. For example, it is shown that for a 40° half-power beamwidth requirement, the array length can be reduced by a factor of 3.5. If narrower beamwidths are required, less size reduction can be realized with the use of superdirective techniques. Patterns for a number of element spacings and array sizes are presented. (a-1, b-3, c-1, d-1, e-977, f-Study and investigation)

BAILEY, A. D., DYSON, J. D., AND ERNST, E. W., "Studies and Investigations Leading to the Design of a Radio Direction Finder System for the MF-HF-VHF Range," University of Illinois, Urbana, Illinois, The Radiolocation Research Laboratory, Third Quarterly Report, Contract No. DA 36-039-sc-84523; April 1966. ABSTRACT: The continuation and extension of the studies and investigations directed toward the design of a Radio Direction Finder System for the MF-HF-VHF Range is being done under two tasks. Under the first task, entitled Radio Direction Finder and Radiolocation System Engineering, the results of an experimental study of a matched twin-channel 30-48 Mc/s VHF to HF down converter are reported, the design for a high-frequency omnidirectional element responsive at all elevation angles of arrival is proposed, further improvements made in the triple interferometer RDF system and plans for a full scale study of nested interferometer arrays are given. Progress on digital computer simulation of other interferometer array configurations and data acquisition system is reported. In connection with the second task, entitled Directional Radio Propagation and Radiolocation Research, an experimental procedure for separating two or three ionospheric modes of propagation and measuring the angles of arrival of each mode is described. Progress is reported on the preparation of a digital computer program for tracing of laterally deviated rays due to the presence of the earth's magnetic field in the ionosphere. (a-1, b-3, c-1, d-1, e-b 1, f-See Abstract No. 5216)

LEAVENS, J. L., "Assistance in the Development and Evaluation of Bearing, Distance, and Heading Indicator (BDHI) Instrumentation," Naval Air Development Center, Aero Mechanics Department, Johnsville, Pennsylvania, Report No. NADC-AM-6610, ASTIA No. AD-631 152; 4 April 1966. ABSTRACT: BDHI instrumentation in current aircraft cannot perform to one-degree accuracy. Large errors occur during change of heading of the aircraft, and an indication lag of from four to eight degrees is common. Specifications for the equipments which are the source of signal inputs for the BDHI are wholly inadequate in defining the synchros that are to be used in the system. The BDHI specification, MIL-I-22075, does not require that the indicator be tested using the inputs that are the same as those to which it would be connected in an aircraft. Consequently indicators can pass all the requirements of the specification and still not perform satisfactorily when installed in an aircraft. If torque receiver synchros are to be used in the BDHI, then the systems which drive the BDHI must contain torque transmitter synchros. With the proper type of torque synchros installed, a satisfactory BDHI instrumentation system can be had without requiring the indicator pointers to be servo driven. (a-1, b-3, c-1, d-1, e-0, f-Evaluation report)

ERNST, E. W., AND GRUSH, H. L., "A Digital Bearing Computer for a Small Aperture Radio Direction Finding System," Southwestern IEEE Conference Record, Dallas, Texas; 20-22 April 1966. ABSTRACT: The Watson-Watt RDF System is a small aperture system capable of indicating the direction-of-arrival of an rf signal instantaneously. The use of two channels for processing the information gathered by the antenna array permits the instantaneous determination of the direction-of-arrival. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

FENWICK, R. C., "Wide-Band Capacitively Tuned Electrically Small Antennas," Southwestern IEEE Conference Record, Dallas, Texas; 20-22 April 1966. ABSTRACT: An electrically small antenna that uses only variable capacitors for tuning over a wide band is an attractive concept. Some of the more obvious potential advantages of capacitively tuned antennas, as opposed to inductively tuned antennas, are: (1) Sliding or switched contacts can be eliminated (in certain types of capacitors). (2) Small capacitors can handle the high currents encountered in electrically small transmitting antennas. (3) Capacitor losses are lower. (4) Capacitor tuning speeds can be very high (for certain types). (5) Electronically tuned capacitors (varactors) have lower losses than electrically variable inductors. (6) Variable capacitors are commercially available in a wider variety of configurations than variable inductors. (a-1, b-1, c-1, d-1, e-0, f-Description and analysis)

MOORE, J. D., AND CASTLES, M. P., "The Coaxial Spaced Loop as a Small Aperture Multipolarization Radio Direction Finder Antenna," Southwestern IEEE Conference Record, Dallas, Texas; 20-22 April 1966. ABSTRACT: The pattern of a coaxial spaced loop direction finding antenna will provide D/F bearings and signal polarization information for all source polarizations and angles of incidence. The antenna, therefore, has significant advantages over a simple loop which will exhibit a null shift of 90° between vertical and horizontal polarization and give no clear indication of the polarization received. A two-step sense technique will resolve the four-way ambiguity which exists for vertical and mixed polarization and the two-way ambiguity for horizontal polarization. The argument that spaced loop antennas have poor sensitivity does not apply in practice when tuning is used in conjunction with appropriate antenna preamplifiers. This technique will readily provide sensitivities of 2 microvolts per meter in the high portion of the HF range without resorting to physically large antennas. Field test data on an experimental model to determine D/F accuracy and sense performance have been obtained showing verification of theoretical performance. It has also been found that spaced loops which used loops with balanced gap electrostatic shields are superior to a coaxial spaced loop which uses loops with a conventional electrostatic shield. (a-1, b-1, c-1, d-1, e-1000, f-Descriptive analysis)

MARTIN, P. R., AND LORENZ, R., "Circular Arrays of Beverage Antennas for High Frequency Direction Finding. Interim Development Report for a Study Technique to Produce a High Frequency Land Based Direction Finder Utilizing Traveling Wave Beverage Antennas in the Air-Earth Interface," Southwest Research Institute, San Antonio, Texas, Contract NObsr-89345; 30 April 1966. ABSTRACT: Extensive measurements have been made on a variety of Beverage antennas in the 1.5 to 30 mcs range showing feasibility of using the antenna as the basis of a wide aperture sky wave direction finder. Antenna attenuation constant, velocity ratio, impedance and effective height have been experimentally measured and theoretically determined versus frequency, antenna height, length and the ground constants. Sufficiently good experimental and theoretical agreement has been obtained to permit acceptance of an existing theoretical model of the Beverage array which is well suited for further investigation of modes of operation not easily or cheaply investigated experimentally. Experiments show an element height of two meters or lower is optimum for the 3 to 10 mcs range. Still lower element heights (on the order of .5 meter) are probably optimum when the antenna is short. Tests with ground wave signals from a local target transmitter have indicated that an element should be at least one-half wavelength long to obtain unidirectional patterns but no longer than one wavelength to maintain signal sensitivity at high elevation angles. A sequentially operated solid state antenna commutator has been designed, constructed and operated successfully. A new low level RF switch design has overcome disadvantages of previous developed diode switches and linear summation of antenna inputs can now be accomplished without insertion

loss and with pedestalless, almost transient free, operation. Theoretical calculations show that external phasing of individual elements will produce narrow azimuth plane radiation patterns relative to simple nonphased summing. Furthermore, it appears possible to approximate optimum phasing, by a simple scheme that could be accomplished with two solid state sequential commutators of the type now in use. (a-1, b-3, c-1, d-1, e-1000, f-Descriptive analysis)

MOORE, J. D., AND CASTLES, M. P., "HF Spaced Loop Antenna," Southwest Research Institute, San Antonio, Texas, Quarterly Report No. 1, Contract No. DA 28-043-AMC-01960(E); 30 April 1966. ABSTRACT: The theoretical performance of the three common spaced loop antennas is discussed in detail. For portable application, the coaxial spaced loop has been selected because it is well known and is superior to the coplanar spaced loop in terms of the direction finder requirements. Theoretical coaxial spaced loop and sense patterns are given for a number of signal polarizations for angles of elevation up to 85°. Theoretical sensitivity calculations are made to derive coaxial spaced loop parameters to obtain 10 microvolt per meter sensitivity. Field testing of three breadboard coaxial spaced loop antennas has received emphasis in the experimental investigation conducted in the first three months of the program. The breadboard models have verified that a directly tuned coaxial spaced loop with an effective volume of 1.5 cubic meters, 3-turn 24-in. square loops spaced 54 in., will yield a 10 microvolt per meter sensitivity for a 10 dB signal plus noise-to-noise ratio between 4 and 8 MHz. The D/F performance of the third and final breadboard model is excellent both for controlled polarized signals from an elevated target transmitter and when used in bearing tests on skywave signals. Stray pickup in the antenna electronics box did produce some pattern distortion and bearing error until improved control cable shielding corrected this problem. (a-1, b-3, c-1, d-1, e-1000, f-Progress report)

WATT-CARTER, D. E., HITCHCOCK, R. J., WILKINSON, D., BRICE, P. J., HORNER, F., ET AL., "Discussion on Atmospheric Radio Noise Received on Directional Aerials at High Frequencies and Characteristics of Atmospheric Radio Noise Observed at Singapore," Proc. IEE, vol. 113, no. 5, pp. 752-754; May 1966. ABSTRACT: This article deals with a discussion among critics concerning the analysis of atmospheric radio noise data recorded and observed at Singapore, and reported to the Professional Group E-11 of the Electronics Division of the Institute of Electrical Engineers on 3 November 1965. (a-4, b-1, c-1, d-5, e-0, f-Discussion and critique)

EARP, C. W., "Performance-Defining Parameters of Radio-Navigational Aids," Proc. IEE, vol. 113, no. 5, p. 767; May 1966. ABSTRACT: In its broadest aspect, the object of the paper is to draw attention to the need for a formal theory of radiolocation. An approximate analogy is drawn between the time, about 20 years ago, when the "knowhow" of the experienced communication engineer was being translated into a formal theory of communication, and the present time, when, despite the existence of a corresponding expertise in the field of radiolocation, no serious attempt has been made to define a formal theory. In radiolocation, the concept of trading "aperture" or "baseline" for accuracy, very closely allied to the concept of trading frequency bandwidth for suppression of noise in communication systems, is very well known, and has probably been fully exploited, but theoretical limits have not yet been defined. The further concept that the frequency bandwidth of a radiolocation signal can also be traded for error suppression, though not new, has probably not been fully explored and certainly not fully exploited. It is therefore a major object of the present paper to draw attention to this important aspect. A complete assessment of the value of an increased frequency bandwidth is not attempted, and no attempt is made to define an ideal system. However, by analysing a comparatively simple and practicable system which employs wide-deviation frequency modulation, and lends itself to a simple mathematical treatment, it is shown that a great improvement is possible. A simple aircraft approach-path guidance system comprising two laterally spaced, synchronously frequency-modulated transmissions is shown to have a greatly improved error-suppression characteristic, compared with conventional systems. The concept of "effective bandwidth", as already used in communication theory, is introduced, showing that, though the frequency bandwidth used by a single location device may be very large, this may not be prohibitive, as a number of devices may share the same frequency band without mutual interference. This leads to a suggestion for a new aircraft guidance system providing azimuth indication, as in VOR, approach-path guidance, distance-to-fly indication, glide path and distance along runway, all on a single radio-frequency channel. (a-1, b-1, c-1, d-5, e-0, f-Principles and definitions)

KING, R. J., MALEY, S. W., AND WAIT, J. R., "Ground-wave Propagation Along Three-Section Mixed Paths," Proc. IEE, vol. 113, no. 5, p. 747; May 1966. ABSTRACT: Recent theoretical work on the propagation of groundwaves along 2-section mixed paths is extended to 3-section paths. A corroborating experiment was conducted at a microwave frequency of 4.29 Gc/s (λ = 7 cm), using water to simulate imperfectly conducting mediums and aluminum plates to simulate perfectly conducting mediums. The experimental results show that the theoretical solutions are accurate to within a few per cent, provided that both aerials are at least a fraction of a wavelength from the separation boundaries. (a-1, b-1, c-1, d-1, e-0, f-Propagation study)

THOMPSON, A. S., "Boresight Shift in Phase Sensing Monopulse Antennas Due to Reflected Signals," Microwave Journal, vol. 9, no. 5, p. 47; May 1966. ABSTRACT: The use of anechoic chamber environments for plotting antenna patterns has demonstrated the difficulty of measuring true antenna patterns because of the effect of interfering reflections on the recorded pattern. In the original article by Cohen and Steinmetz it was shown that a boresight shift would occur in a phase sensing monopulse antenna if a precomparator phase shift γ occurred between the two antenna feeds. In the following theory the effect of various levels of reflection on the shift in boresight is derived. (a-1, b-1, c-1, d-1, e-0, f-Theory)

DAVIES, K., AND BAKER, D. M., "On Frequency Variations of Ionospherically Propagated HF Radio Signals," Radio Science, vol. 1, no. 5, pp. 545-556; May 1966. ABSTRACT: A technique for measuring the frequency variations of ionospherically propagated radio waves by spectrum analysis of the received signal is described, together with some theory needed to interpret such measurements. Examples of the types of variations observed with both vertical and oblique propagation are presented. On "quiet" days in middle latitudes, frequency variations of the order of ±0.2 c/s occur, having periods of the order of 10 min. During disturbed periods the variations may be as much as 2 to 3 c/s on 5 Mc/s with vertical propagation. The frequency stability is generally greater for oblique propagation than for vertical propagation; however, the received spectrum is broader for oblique propagation. The frequency stability of E echoes is, in general, much greater than that of F2 echoes. At night and during some geomagnetic storms, the discrete (line) spectra give way to diffuse spectra. During periods of flutter fading at low latitudes, the discrete spectra are transformed into continua with frequency spreads of up to ±5 c/s about the mean value. Distinctive frequency deviations are caused by solar flares, geomagnetic disturbances, and traveling ionospheric disturbances. Of these, the solar-flare-induced frequency variations are the most striking. Deviations of up to 50 c/s have been observed on WWV-10 Mc/s received at Boulder during flares. However, frequency deviations associated with solar flares have a most probable duration of about 4 min, and the majority of them have magnitudes less than 1 c/s. (a-1, b-1, c-1, d-1, e-0, f-Propagation analysis)

DEWOLF, D. A., "Impedance of a Small VLF Dipole in the Ionosphere," Radio Science, vol. 1, no. 5, pp. 571-575; May 1966. ABSTRACT: Previous workers have shown that by taking into account the nonzero dimensions of actual dipoles, the infinity catastrophes of the impedance of VLF dipoles ($X \gg 1$, $Y \gg 1$) in a magnetoplasma, as well as of the far fields, are eliminated. Nevertheless, the use of very small dipoles may still not lead to valid results if collisionless magneto-ionic theory is utilized. Criteria are established for temperature and collision effects which modify magneto-ionic results, depending on the relative magnitudes of source dimensions, electron temperature, and collision frequency. Ion mobility effects are not taken into account. In the extreme case, radiation of very small dipoles in a sparse low-temperature plasma with high d-c magnetic field cannot be predicted by linearized plasma-kinetic theory. (a-1, b-1, c-1, d-1, e-0, f-Analysis)

MASON, J. F., "Vietnam, Electronics in the War," Electronics, vol. 39, no. 10, pp. 95-118; 16 May 1966. ABSTRACT: A descriptive survey of military electronics being used for both tactical and strategic purposes in the Vietnam mission. (a-4, b-2, c-1, d-1, e-0, f-Descriptive survey)

KORVIN, W., AND CHADWICK, G. C., "Latest Word in Space Talk: It Came from Anywhere. Phased-Array Antenna Provides Satellites with Coverage in All Directions, with High Gain Transmitting or Receiving during Communications with Ground Stations or Other Satellites," Electronics, vol. 39, no. 11, pp. 117-126; 30 May 1966. ABSTRACT: A very descriptive discussion concerning the phased-array antenna systems used on NASA satellites. Basic theory and fundamentals are also presented. (a-4, b-2, c-1, d-1, e-0, f-Description)

GREEN, T. C., AND SHERRILL, W. M., "LF to VHF Direction Finding Research," Southwest Research Institute, San Antonio, Texas, Interim Report, Contract No. NObsr-89167; 31 May 1966. ABSTRACT: A description of the crossed spaced loop antenna corrosion observed after the USS BROWNSON calibration (see abstract dated 1 April 1966) and the subsequent overhaul and welding are described. D/F calibration tests on the Southwest Research Institute tower have demonstrated that the overhauled antenna performed essentially as well as before the BROWNSON calibration in the 2-4 MHz range. Techniques for operating the 5-ft spacing crossed spaced loop antenna in the low VHF spectrum were investigated. The use of resistive shunting networks at the crossed spaced loop feed point had the effect of smoothing the antenna impedance characteristics which permitted phase and amplitude tracking of the two crossed antenna pairs to approximately 80 MHz. Calibration curves obtained with and without these resistive shunts show significant improvement for the shunted antenna. The most promising technique found for operating in the series resonance frequency region is open circuiting one of the paralleled crossed spaced loop pairs for each of the sin 2 ϕ and cos 2 ϕ antennas. The D/F calibrator modification design was completed, and the hardware modification design was 40% completed. The modified calibrator will employ a continuous single turn rotary observed bearing potentiometer which will eliminate the present need for rewinding the 10-turn OB potentiometer. A brief discussion of the application of ferrite core antenna techniques to the shipboard crossed spaced loop is summarized showing the attractive size and weight reductions attainable at the cost of much lower frequency antenna resonances. A summary of multichannel D/F and sense techniques is given in a form not reported before for this contract. It is shown that simple combinatorial logic circuits may be used to provide sense ambiguity elimination with a response time limited by the D/F circuit bandwidth. In addition, bearing and sense may be obtained independently and simultaneously using multichannel techniques. (a-1, b-3, c-1, d-1, e-1000, f-Interim report)

ADACHI, S., "Theory of Duct Propagation of Whistler Radio Waves," Radio Science, vol. 1, no. 6, pp. 671-679; June 1966. ABSTRACT: The previous theoretical analysis by the present author on the propagation of whistler radio waves along an enhanced or depressed magnetoplasma slab imbedded in an infinite magnetoplasma is extended to include the general case of an arbitrary thickness of the slab. As a result, two different types of completely guided waves are found to exist in general. The one guided wave is essentially a surface wave trapped along an interface between two semi-infinite plasmas of different plasma densities, while the other guided wave is a duct type of surface wave in which the whistler plane wave is predominantly propagated inside the slab by the successive total reflections at the walls of the slab and is propagated along the depressed plasma slab only. Dispersion properties of these completely guided waves are studied in detail. (a-1, b-1, c-1, d-1, e-0, f-Sferics theory)

VINCENT, N.D., AND LYNN, P. A., "The Assessment of Site Effects on Radar Polar Diagrams," Marconi Review, vol. 28, no. 157, p. 111; June 1966. ABSTRACT: This article describes a proposed theory, based on Huygens' principle, for the assessment of site effects on radar polar diagrams, and compares this both with the previous one based on geometrical optics, and with experimental measurements. The measurements show that the proposed theory gives improved predictions for undulating sites, but that in its present form it cannot cope with sharp discontinuities such as wire fences. (a-1, b-1, c-1, d-5, e-0, f-Theory)

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